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EDITORIAL NOTES.

The Coal Export Restriction Order.

THE coal export restriction order has already led to trouble with the coal proprietors and factors; but the Coal Exports Committee are firmly resolved to carry out, with judicial care, the duties assigned to them. If they do not do this, their appointment, and their existence in attaining the two main objects sought, will have been futile. Deputations of coalowners and contractors have had interviews with the Committee, and have had assurances from them that (as might have been pre-supposed) the utmost discrimination will be used by them in the discharge of their functions. But there cannot be discrimination if the Committee are to be unduly rushed; and they do not mean to be. They have promised replies within forty-eight hours of the receipt of applications for licences; and they have relaxed some of the stipulations at first required in the matter of information. But telegrams and other tactics have been resorted to with the view to securing licences—the "other tactics" including the loading of coal and coke on ships, and then urging delay of vessels and other considerations as reasons for the prompt issue of permits, without any opportunity for thorough examination of all the points affecting compliance with the conditions. If this sort of thing were allowed, the Committee could not possibly get through their work, nor give adequate attention to the various applications, in order to ascertain that in all respects they were satisfactory. The Committee have therefore very properly issued what is tantamount to a warning, to the effect that applications to them should be made early, and that in future they will not be influenced by the fact that the coal in question has been shipped, and that the ship may be delayed, nor by other extraneous circumstances. These are matters that have nothing whatever to do with the duties of the Committee, which are judicial and therefore precise. Whatever coal-owners or factors choose to do in connection with preparing, or making arrangements, for export must be entirely at their own risk, and subject to the granting of a licence. Therefore, submissions such as those to which reference has been made will not weigh with the Committee; and they are now ignoring them as well as all telegrams.

Naturally one of the first effects of the order relating to the control of coal exports was the suspension of contract making for new export business. But this, it is stated, is now being resumed. There is no harm in this, providing the coal people exercise discretion in the matter of entering into fresh contracts; for the length to which licences will be issued ought to be fairly obvious to them. For example, one would not imagine that licences would not be granted for the shipment of the coal needed at the works of a British owned concern such as the Monte Video Gas Company, although their operations are being conducted in a neutral country. The Chairman (Mr. Charles Hunt) alluded to this point at the meeting of shareholders last Wednesday. Of course, the Directors are now confronted with such an enormous rise in the cost of both coal and freights as to be a serious menace to future profits. "What may happen," said Mr. Hunt, "in regard to coal supplies, it is impossible "to say. The Government have decided to prohibit ex-"ports to neutral countries. This, however, can hardly "be meant to apply to a British-owned undertaking such "as this is, upon which a stoppage of coal supplies from "England would inflict far greater injury than any benefit "likely to result therefrom to English consumers could, by "any possibility, justify." We absolutely agree with Mr. Hunt; but the questions for the Committee are not quantitative ones or relative effects so much as of principle, with assurances, and the exercise of discretionary power. It cannot be imagined that British owned gas companies working in neutral countries, who give satisfaction that the coal they ship will be used entirely for their own purposes, will be denied supplies, under the discretionary powers given to the Committee.

The capital reasons for coal-export control are three—to prevent British coal reaching enemy countries, to give assurance that the coal is not used in neutral countries for the benefit of enemy countries (a case is known of works, situated in a neutral country and using English coal, which have been engaged, but are not now, in making ammunition both for the Allies and Germany), and to above all retain more coal for home consumption. It is well known that there has been great pressure for fuel on some home works supplying material for the war, just as there has been great pressure on gas-works supplying not only factories with gas for power, heating, and lighting for enabling them to produce munitions of war, but the Government authorities with certain essentials for the manufacture of high explosives. This ought not to be while coal is leaving our shores for neutral countries. In Germany, special facilities are being given for the delivery of coal to railways, gas and electricity works, and to contractors for Government war supplies. Although there are many things in this terrible war in respect of which Britishers would shun to imitate Germany, there are other things which provide for them very useful lessons. And this assuring of the coal supply to the works and factories mentioned is one of them. Some of our own coal owners and factors, far from giving special facilities in these directions, seem urgently desirous of making export contracts, which help to create the conditions in this country which they say, with their tongues in their cheeks, warrant, under the beautifully flexible law of supply and demand, higher and yet higher prices being charged for home consumed coal. It does not seem to have occurred to the coalowners, who are able by common agreement to rule home prices, that their position would have enabled them by voluntary action to show a large patriotism in those very directions in which the Government are now exercising regulation. But they would not; and it has been a matter of compulsion, which is not to their credit.

Another direction in which an arranged control has been effected has relation to prices for household coal in London. There have been conferences at the Board of Trade, as the result of the price scandal of last winter, and no doubt of the revelations made—regarding the profit-sharing system obtaining between the coal owners and merchants—in the report of the Coal Committee appointed by the Board of Trade to inquire into matters associated with the supply and price of coal. As a result of these conferences, the principal coal merchants have arranged with the President of the Board for a limitation of profits to be made by them from the sale of household coal during the summer months. It is anticipated that the arrangement will be carried into the winter. The Board ought to see that it is, because it will be next winter when the poor will feel something more than the "pinch" of war conditions, and stocks of fuel cannot be laid in by them. Even had they the convenience of storage, they have not the money. The Board should now confer benefit on the country generally by also dealing with the question of profits on coal supplied for home industrial purposes.

An Advisory Council of Industrial Research.

No Government of any country of front importance could have made less endeavour than our own to help the industries which are the real producers of the national revenues. But it certainly does seem that the war has awakened the Government to the necessity of something more being done than hitherto. Even the Board of Trade returns prior to the war had not made the Government truly cognizant of the extent to which this country has been dependent upon those of our enemies for supplies of materials and manufactured goods—the commodities being, in not a few instances, such as could be produced equally well in this country.

Nor, again, had the returns suggested that there might be reasons for this state of things, of which time was witnessing an expansion. The fact is certain of our industries had got well rutted with their old productions, and were allowing the competitors from across the sea to come in with improved or new styles of goods, and whittle-away home business in the directions affected, until it was becoming a shadow of its former self. Furthermore, the manufacturers in foreign countries—Germany especially—were more ready than were the manufacturers in some lines of "enterprise" in this country to promote their own interests by deliberately directed research. The war has compelled attention to all these things, and to the causes. Our Government have at length appreciated that the fostering care of the German Government has been largely helpful to the development of the export trade of that country, and thus to increasing the wealth of the home industries, and to providing employment. They have also at length learned that just as knowledge of the at present obscure is only to be obtained by exploration, so continuous extension of our industrial influence and great wealth is only to be secured by the aid of research. There are, however, degrees of appreciation; and the appreciation of the Government, judging by some of their plans for doing good, seems to be erring on the trifling side. The principle of what they propose is excellent; but their plans are covered and limited by a false economy. We saw this in the meagre sum set apart for research in connection with the national dye and colour scheme. It is seen again in the proposal to establish an Advisory Council of Industrial Research; and to make a beginning with research work on only £25,000 to £30,000 a year. This sum appears to be very inadequate for research work on a scale commensurate with the position of the country in industry and commerce, and with the enormous aggregate value of its trade.

This, of course, is a matter of opinion; but we cannot think that anyone closely engaged with industry, and knowing with some intimacy the benefits accruing to those industries in which research is part and parcel of their progressive life, and the stagnation that eventually overtakes those industries that "carry on" merely by rote, can really agree that the Government have risen to the occasion with the liberality which might have been expected of them. They, in effect, fully admit the backwardness of this country in an essential to the promotion and maintenance of its industries; and it is something to the good that they have got so far along the road to an acknowledgment that industrial premiership is not to be held by doing nothing on the lines that by others have been proved to be productive of industrial and trading expansion. Research should be made a real live factor in the economic position of the nation. Perhaps we are expecting too much at this stage from a Government within whom the spirit of doing something for the promotion of discovery has only just been generated; for, having gone so far, it is probable that their incipient proposals will grow with time into something that will better become the situation.

Mr. J. A. Pease, the President of the Board of Education, introducing to the House the other day the scheme for an Advisory Council of Industrial Research, quite agreed that this country could not possibly hope to maintain its manufacturing position in the world unless a better system was promoted for the encouragement of scientific research in the Universities. We want trained brains for this work, to help the country to succeed, just as Germany has succeeded, in branching-out on new lines and improving upon the old ones. And the men required are those who will deliberately apply themselves to the work, and do not expect that the bearing of some academic distinction is sufficient justification for the payment to them of an annual salary. Mr. Pease says that the Government are in accord with him that something should be done at once to make more use of scientifically trained men in industry, and to prepare for an increased supply of them. Universities such as Manchester and Leeds, and now the Imperial College of Science, have done much in promoting this end; but to get the full effect of their work, and that of other places of technical education, some organization is required that will bring such work, and that which will proceed where the Government bestow their patronage, into closer association with the industries. Such an organization Mr. Pease considers will be provided by his Advisory Committee of Industrial Research, who, according to present ideas, will consult with expert committees working in different directions, and who in turn must be associated with leaders of industry. In this way, the Advisory Council will have communication with the industries.

It is hoped the Advisory Council will enter upon their work within the next few weeks, and that they will soon be operating in close touch with the Board of Trade. For our part, we hope this over-burdened authority will not be further taxed. Its inefficiency has direct relation with the growth of its work. The Government have got hold of a good scheme in this Advisory Council of Research; and to it there should be applied the old precept that "anything "that is worth doing at all, is worth doing well."

Neglect of Preparation.

In the great war in which we are engaged, there are lessons for industrial concerns as well as for the nation. One of them has to do with preparation for all eventualities; and this particular one has very peculiar interest for the gas industry. It arises from an asserted disregard of warnings, to which other countries—especially Germany—gave heed, that there is the present rush in this country to recover as much as possible of the toluol from the gas and tar produced by gas undertakings and coke-oven plants. The military correspondent of "The Times," writing from France lately, made grave accusations as to the shortage of high explosive shells at the British front; and there seems to have been a substantial amount of truth in what he said, for inquiry in the House resulted in somewhat ambiguous answers, and Lord Kitchener subsequently openly said that whatever deficiency there had been would in the near future be entirely a thing of the past. Gas undertakings are, among others, working with energy to this end. There is not the slightest question that the present campaign—a campaign of unprecedented magnitude—was entered upon by this country, in respect of its military resources, before it was sufficiently and efficiently prepared; and yet, had the magnificent resources of the country been put to their best use in peace times, the contrary would have been the case. High explosive shells and bombs have become of premier importance in modern warfare; for, thrown by howitzers, the projectiles, being fairly heavy, have a steep angle of descent, and so can deal with modern trenches, shells, dug-outs, and barbed-wire entanglements in a manner impossible with shrapnel or other ammunition. It is stated that ever since the Manchurian war, the German Army has been preparing itself with imposing howitzer batteries and high explosive shells, and special guns which throw bombs also filled with high explosives. The French, too, are using practically nothing but high explosives. All these facts have not been kept secret; but our military authorities did not sufficiently heed them, nor their warning. Results: A deficiency of shells suitable for modern requirements, and a rush to make good the deficiency, and to prevent its recurrence. All who can do so have been, and are increasingly, willing to help in repairing the mischief of a past neglect. The lesson ought to be useful in other directions.

Thermal Conductivity of Refractory Materials.

Some of the most interesting work that has been done of recent years in connection with the Institution of Gas Engineers has been by the Refractory Materials Committee; and the further the Committee have gone, the more apparent it has become how little was formerly known in this country as to the physical properties essential to the production of suitable retorts and other material for retort-settings. Each report has opened up some fresh ground and line of thought. The subject, indeed, offers a field of research of such magnitude that the Committee, and not less their technical adviser (Dr. J. W. Mellor), must welcome independent investigation into phenomena and problems associated with it, especially research in which Professor John W. Cobb, the Livesey Professor at the Leeds University, is concerned. Professor Cobb, in collaboration with Messrs. Dougill and Hodsman, has begun an investigation into the thermal conductivity of refractory materials; and their procedure and the results so far obtained have supplied the matter for a paper read before the Yorkshire Section of the Society of Chemical Industry.

Refractoriness of retort material must always be the predominant quality for high temperature work; but there has been a proneness to allow the predominant quality to have large isolation from all other considerations. In effect, the paper Professor Cobb and his associates have presented

cautions against this attitude. Consideration must be extended to various factors, in order to ascertain whether a blend of other qualities which might influence the attainable refractoriness might not have an economic effect upon the work for which the refractory material structures are designed. The power of heat transmission in retort material, for example, is one of these factors. It is one that has had spasmodic reference in technical deliberations. Mr. Thomas Glover, Mr. R. M. Searle (one of our American visitors at recent meetings of the Institution), and others have incidentally alluded to the question; but no sufficiently definite work has been done in regard to it to enable one to say how far refractoriness may safely be sacrificed to obtain a quicker transmission of heat through the material. Here we have two physical qualities offering resistance one to the other. To put the matter generally, the higher the refractoriness, the greater the porosity of the material; but, in the paper before us, we have it laid down as an acceptable fact that the transmission of heat by refractory materials is impaired by porosity. This being so, a balance has to be struck between refractoriness and conductivity; and it is therefore desirable for practical purposes to know where the line should be drawn—seeing that, regarded practically, it must follow that the greater the thermal conductivity of retort material, the greater should be the carbonizing speed and therefore capacity, and the smaller the fuel account in relation to work done. The section of the paper dealing with porosity is interesting, and promises expert discussion; for the authors have there set themselves to correct what they are convinced is a false doctrine, which, they obviously are of opinion, may be misleading to the makers of retorts and fire-bricks, and perhaps to purchasers.

The work of the investigators gives a certain amount of support to the observed deduction from working experience in America, that the temperature conductivity of silica materials appears to be, at high temperatures, somewhat higher than that of fireclay materials; but at low temperatures there is nothing much to choose between the two. Again, there are gas engineers who have marked preference for brick retorts, rather than for monolithic fireclay retorts. The paper supports their faith. In order that the whole retort may reach the purchaser in good shape, it is soft baked; and soft-baked retorts have a low thermal conductivity. This is corrected somewhat in use; but retorts built-up of hard baked bricks have a greater heat conductivity. The investigators have also had their attention directed to the variation of conductivity at different temperatures with different material; but no definite conclusions have as yet been arrived at. However, they are on a good line of research; and the preliminary work promises that its continuation will produce an expansion of knowledge and definite results, for which the thanks of the gas industry will be due.

Co-Partnership a "Total Failure."

It would be very easy for many things that are of service to humanity, and have helped to ameliorate differences in social conditions and conveniences, to be condemned if only a single or narrow point of view were permissible, and all others were denied consideration. Co-partnership is one of those things that require to be looked at from more than one point of view. A correspondent, who is an employer of labour, asserted in our columns the other week that the scheme of co-partnership as introduced by the South Metropolitan Gas Company, and adopted by the Gas Light and Coke Company and many other companies, had totally failed. This employer of labour does not appreciate the true meaning of "co-partnership" as obviously—at any rate the majority of—workers of the companies mentioned do.

A co-partnership that does not take into account times of adversity as well as times of prosperity is not a true co-partnership. But this man of business, who ought to have known better than to look at the question of the success or the failure of co-partnership from a single point of view, says it was apparent that the making of the workers' share practically dependent upon the cost of raw material at the works was inherently bad, and bound to fail at such a time as the present, when raw material had risen to such a point that the share of the worker is almost entirely wiped out. A South Suburban co-partner last week rightly pointed out that the critic had altogether missed the principles of the scheme. Those principles take in all the factors of a real co-partnership—not alone the price of raw material—and what is more they are highly constructive in improving the lot of the gas-worker. If we only considered the moral effect of co-partnership as practised by the London Companies, the system would more than justify itself in ordinary let alone in these critical times. But if at any time the true spirit of co-partnership has been evidenced more than at any other by bonds and acts of sympathy and efforts to make the best of dark circumstances, that time has been since the war started. We regard those things that have been existent during recent months, and are so in the present state of affairs, as more illustrative of the "true "spirit" of co-partnership than anything we have ever seen. Looking round other fields of labour, in some of them there has been excellent evidence lately of the non-existence of co-partnership, and of the ascendancy of selfishness over a loyalty to the country.

But taking the material side of co-partnership—leaving out of consideration as not being required for the proof of the case the advantages attaching to the subsidiary beneficial schemes—can it be fairly said that a scheme "has "totally failed" that has in twenty-five years placed in the possession of the South Metropolitan workers £691,596 that they would not otherwise have had? Has a scheme "totally failed" that is responsible for having built up a stockholding by the employees amounting to £348,905, with a further £30,000 held by pensioned employees and widows? We are sufficiently materialistic to look upon these figures as tokening something other than failure. This stockholding was built-up in times of peace and prosperity. It is a protection against the share of the worker being wiped out in such abnormal times as the present. The two last-named sums total to £378,905; and the reduced dividend of £4 8s. per cent. per annum, means on this sum a distribution of £16,666 for a year, even if there were no bonus forthcoming. This considerable amount of dividend would not be the portion of the employee co-partners had it not been for the scheme which our employer correspondent calls a "total failure." If the critic goes on misnaming things in this way, he will soon be calling an elephant a mouse, a palace a hovel, and the Kaiser the most angelic and peace-loving person on the face of the globe.

Post-War Coke Selling.

Truth is not always palatable; and there will be secret concurrence with this on the part of those gas managers whose consciences are smitten by the remarks, anent coke sales, made by Mr. W. M. Mason, the Secretary of the British Commercial Gas Association, at the meeting of the gas engineers and managers of Wales and Monmouthshire last Thursday. He pointed to the fact that twice in recent years when the gas industry has been in a tight corner in regard to the disposal of coke, outside influences have come to relieve them—the national coal strike and now the war. We cannot expect any such influences—and we do not want them—to arise for the benefit of the coke market when the burden of coke storage grounds is over-running the prescribed bounds. But it seems to Mr. Mason that many gas managers—not all, but "many"—instead of learning from their experiences to develop local coke sales simply go to sleep again. He is afraid that in not a few cases this will be the result after the war, and that, in the districts concerned, there will be a falling-back to pre-war conditions. This is not hopeful; but we fear there is truth in what Mr. Mason has to say, though it cannot be applied universally. Those who are indifferent to the cultivation of local coke sales, are the enemies of the whole of the more diligent gas managers. They are the ones who contribute, by their indolence in the matter of local sales, to the depression of prices; and they are the ones who practice that form of business piracy which consists of dumping coke into the districts of managers who have devoted time, energy, and money to building-up a home coke market. We read in connection with the war of fresh trenches being taken, and of the new position having been consolidated by the winning army. It is hoped that at the end of the war, it will be found that every gas undertaking has used the opportunity of gaining fresh "trenches" in the shape of coke consumers, and of "consolidating" its position with them.

The Manchester Coal and Gas Fire Tests.

The "Electrical Times" has evidently been invited by an "esteemed Manchester councillor" to say some nasty things about the recent report upon the "tests" of coal and gas fires

at the Town Hall, which culminated in a recommendation (it was adopted) to fit gas-fires into the Committee rooms which are only intermittently occupied. The opinion may be hazarded that the "esteemed councillor" was not unidentified with the Electricity Committee, who declined to enter electric radiators into the competition. Seeing that this was the case, the fulminatory article in the "Electrical Times" is somewhat inexplicable. For most part, the tirade is directed to the conditions under which the comparisons were carried out; and as (as indicated by the paragraph on p. 380 of the "JOURNAL" last week) it is impossible to defend, on the ground of scientific accuracy, the conditions under which the comparisons were made, we need not comment on the string of invective which the "esteemed Manchester councillor" succeeded in extracting from our contemporary. But to the invective, there is palliation; for our contemporary says: "We find no fault with the decision of the Town Hall Committee to instal gas-fires as a step towards smoke abatement, of which Manchester stands so greatly in need. But one may strongly deprecate its justification on the grounds of any economy deduced from tests of the kind that we have before us."

Nonsense.

Having said this, our contemporary winds up by quoting from the report what it describes as "nonsense," but it does not in any way attempt to justify the disparaging term. The first item of so-called "nonsense" is this: "One great advantage of the gas-fire for heating the rooms under consideration is that it can be got to work at a moment's notice, with the certainty that the rooms will be quickly raised to the desired temperature." Is it not true that a gas-fire can be got to work at a moment's notice, and is it not true that the room will be quickly raised to the desired temperature? There is no denial in the article, and no proof as to the statement being a fabrication. It is simply dubbed "nonsense," and this suffices in electrical criticism. The second item of so-called nonsense is this: "No smoke, soot, or dust is emitted from a gas-fire, as in the case of a coal fire. This is a consideration in offices, &c., where papers, documents, &c., have necessarily to lie exposed on the desk or table." What is there about this which is contrary to the truth? Then the third item of so-called nonsense is: "Men of science, including the medical faculty, recognizing the utility, economy, and hygienic qualities of the modern gas-fire, are not only recommending these mediums to their friends, but are using them in largely-increasing numbers in their homes and consulting-rooms. One specialist in Manchester has sixteen gas-fires fitted and in use at his residence and professional rooms." These are facts. Being so, why describe them as nonsense? Some of our electrical contemporaries do not trouble about supplying a substratum of justification for their descriptive terms.

NATIONAL CONFERENCE ON COAL SUPPLIES.

ARISING out of the National Conference on Coal Supplies to Gas and Electricity Undertakings, a deputation attended before the Coal Exports Control Committee on Thursday last, and laid the views of the conference before them.

The deputation consisted of Sir Corbet Woodall, the Past-President of the Institution of Gas Engineers and Governor of the Gas Light and Coke Company, Sir John Snell, the President of the Institution of Electrical Engineers, Mr. Alderman Phillips, the Chairman of the Salford Corporation Gas Committee, Mr. Alderman Kay, the Chairman of the Manchester Corporation Gas Committee, Mr. Frank Bailey, the Managing-Director of the City of London Electric Lighting Company, Mr. Charles Carpenter, the Chairman of the South Metropolitan Gas Company, Bailie Smith, the Chairman of the Glasgow Corporation Electricity Committee, Mr. Reginald Neville, M.P., the Chairman of the Brentford Gas Company, Mr. Hanbury Thomas, the Managing-Director of the Sheffield Gas Company, Mr. J. S. Highfield, as representing the Metropolitan Electric Supply Company and Power Companies of Great Britain, and Mr. D. Milne Watson, the General Manager of the Gas Light and Coke Company.

At the general meeting of the Institution of Mining Engineers to be held in London on the 10th and 11th prox., several papers on the absorption of oxygen by coal, which have already appeared in the "Transactions," will be open for discussion, as will also a paper by Dr. J. W. Mellor on "Unknown Clays in Coal Mines." One of the papers to be submitted at the meeting will be on "Boring and Drilling on Oilfields," by Dr. Paul Dvorkovitz.

PERSONAL.

Mr. HENRY JAMES RANDALL has been appointed Works Manager of the Yorktown and Blackwater Gas Company, Camberley (Surrey), in place of Mr. John Meiklejohn, who resigned the position on joining His Majesty's Forces.

At the commencement of the war it was noticed in the "JOURNAL" that two of the sons of Mr. F. C. TILLEY, of Kingsland Road, had joined the Colours. We are sorry to learn that both have recently been wounded. Though Sergeant G. TILLEY, 12th London Regiment, is now getting rapidly well again at a convalescent hospital at Havre, it was last week reported that Private O. TILLEY, of the London Rifle Brigade, died on April 30—three days after being wounded. Much sympathy will be felt for the relatives of the deceased.

Mr. FRED CHADDERTON, whose appointment as Manager of the Barrow-in-Furness Gas and Water Department was recorded in the "JOURNAL" a fortnight ago, was educated at the Manchester Grammar School and the Oldham and Manchester Technical Schools. He commenced his career in the gas profession under the late Mr. John Chadwick, at Oldham; serving four years in the general offices and two years in the drawing office. At this time Mr. T. Duxbury was appointed Chief Engineer to the Oldham Gas Committee. Subsequently, Mr. Chadderton was for three years Chief Chemist at Oldham, having control of this department on all four of the Corporation works. He was then appointed Works Manager of the central works, which position he held for two years. In August, 1907, Mr. Chadderton was appointed as Chief Assistant to the late Mr. W. Fergusson, at Barrow, and from this position, on Mr. Fergusson's death, he has now been promoted.

OBITUARY.

The last number to hand of the "Intercolonial Gas Journal of Canada" contains the announcement of the recent death of Mr. E. WIGGLESWORTH, the Manager of the Perth (Western Australia) Gas Company. Thirty years ago Mr. Wigglesworth left England to take this position, having for some years previously been Works Manager to the York United Gas Company.

News has just reached us of the death, in his seventy-fourth year, of Mr. J. H. THOMLINSON, formerly Engineer and Manager of the Brisbane Gas Company. He retired from the managership in 1912, and was succeeded by Mr. C. F. Broadhead, of Middleton (Lancs.); but he was retained up to his death as Consulting Engineer. Mr. Thomlinson entered upon his duties in 1880, and had superintended the carrying out of all the most important works of the Company. He enjoyed not only their confidence but the warm regard of the large body of men who were employed under him. He was a native of Carlisle.

Mr. R. CLAYTON, the Chairman and Managing-Director of the Cannon Iron Foundries, Limited, of Deepfields, near Bilston, died on the evening of Sunday, the 16th inst. He had been in failing health for some time. Deceased became actively associated with the Deepfields undertaking in 1878, and during his long connection with it the business extended very considerably. He was Chairman of the Black Holloware Association, and a member of the Committee of the Cast Holloware Makers' and Ironfounders' Association, a Justice of the Peace for Staffordshire, and an Alderman of the County Council. He was by profession a solicitor, and practised for some years in London and Wolverhampton. He leaves a widow, three sons, and five daughters.

Official information has been received of the death in action, in France, on the 9th inst., of Lieutenant BRIAN CROOM-JOHNSON, who had been continually engaged in active servive for six months. Deceased, who was born in 1890, was articled to Mr. Frederick Storr, the Engineer and Secretary to the Wrexham and East Denbighshire Water Company; and on the completion of his articles, he was given the appointment of Assistant-Engineer. His skilful services were highly valued by the Company; and his unfailing courtesy and genial manner gained for him the affection and esteem of the whole of the staff. The writer of a letter from the front says: "At 5.40 on the fateful morning, Lieutenant Croom-Johnson, when leading his company into action at the double, bravely shouted, 'Men, three cheers for the 4th Battalion Royal Welsh Fusiliers.'" The letter adds: "I hope that, when my time comes, I may prove as true to my country as was he."

It is with considerable regret, which we know will be shared by a large number of our London and Suburban readers, that we have to announce the death, on Wednesday last, of Mr. EUSTACE EDWARD RUDGE, Secretary of the London Coke Sales Committee, and Coke Manager and Chief Officer of Stores of the Gas Light and Coke Company. Mr. Rudge (who was only fifty-two years of age) had been with the Company thirty-three years; and the opinion entertained of him by his fellow-officers is well summed up in the words of the Secretary of the Company (Mr. Henry Rayner) that he was "an excellent fellow in every way." This, too, is the view of all those who were brought into contact with him through the work he undertook as Secretary of the London Coke Sales Committee, to which work he gave generous and unremitting attention so far as his labours for the Company enabled

him to do. Mr. Rudge was ill for six months before he passed away. At the funeral service at St. John the Baptist, Holland Road, Kensington, last Saturday, a large number of his fellow-officers, and others who had been associated with him in business, assembled to render tribute to the memory of their old business colleague, companion, and friend.

A prominent member of the Parliamentary Bar, and a cricketer of some distinction, was taken from us last Tuesday by the death, in his eighty-third year, of Sir EDWARD CHANDOS LEIGH. Deceased was educated at Harrow, and went up to Oxford, where he took his degree in Law and History, and was elected a Fellow of All Souls College. Coming to London in 1859, he joined the Inner Temple, and was appointed Recorder of Stamford in 1864. In two successive years—1880 and 1881—he was made a Queen's Counsel and Recorder of Nottingham; and in 1883 he became Speaker's Counsel, holding this post until 1907. He was elected a Bencher of the Inner Temple in 1887, and in 1901 he received the K.C.B. Sir Chandos Leigh was a Director of the Imperial Continental Gas Association—a position he had held for nearly a quarter of a century. Owing to illness, he was unable to attend the recent meeting of the Association; and some reference to the absence of the Directors' "valued colleague" was made by the Chairman (Sir Charles J. Jessel) in his opening remarks. Deceased had to mourn the loss of his two sons in the present war—the elder, Major Chandos Leigh, D.S.O., King's Own Scottish Borderers, in March; and the younger, Lieutenant Edward Henry Leigh, Rifle Brigade, during the current month. He fell in action at Fromelles on the 9th inst., and the announcement of his death was first published last Saturday week.

ELECTRICITY SUPPLY MEMORANDA.

To the issues of our electrical contemporaries after the great coal conference of the gas and electricity industries we looked with interest to ascertain what they thought of the matter. The "Electrical Review" gave a condensed report; but evidently considered comment would be superfluous. It was more interested in discussing the topics of "Rubber" and the "British Industries Fair," than in considering the gravity of the present position of the supply of the fuel upon which the greater number of the electricity stations of the country depend. The "Electrician" looked upon the conference as a very proper thing, in view of the seriousness of the situation, and the extreme importance of the whole subject. Though simply a matter of calculation, our contemporary enforces the point as to the gravity to the two industries, when it mentions that combined they consume no less than 20 million tons of coal a year; and therefore every shilling increase in price represents a million sterling. Of the million, 17-20ths fall upon the gas consumers of the country; so that they will have, besides the increased cost of their own coal requirements, several million pounds extra to find this year. Another point made by our contemporary is that a large proportion of the electrical energy now being consumed in the country is being directly used in the manufacture of munitions of war; and therefore if the price of coal is raised to the electricity suppliers, the cost of the production of munitions must also be increased. If, too, the supply of coal to the generating stations is inadequate, the output of important essentials for the war may also be seriously hampered. The same applies, and with even greater weight, to gas-works. An immense quantity of gas is being employed in factories of all descriptions for lighting and power, and more particularly for heating. In fact, the gas-furnace departments of our heating appliance manufacturers were never so busy as lately and now, owing to the demands for war material; and the question for some of them has been how to cope with the rush orders, so that there might be no unnecessary delay in bringing the furnaces into service for the country. Furthermore, there has never been such energy displayed as now to recover from gas and tar the ingredients for making high explosives. There is one other point in our contemporary's excellent editorial. Some complaint was made at the conference that the resolutions did not present any concrete schemes for carrying-out the objects adumbrated therein. The critics did not appear to have any constructive proposals of their own, which is the way of most critics of such things. The resolutions, however, did point to directions in which the conference thought action could be taken by the Government; and, as the "Electrician" points out, the Government, above all others, have the best means and information at their disposal for deciding on the right courses of action. "Meteor" of the "Electrical Times" also had a neat little note on the subject. He charges the Government with not realizing how small is the margin of safety, with shirking the great peril, and with allowing it to "work out its own salvation." He agrees that the limitation of coal exports is something; but this alone cannot save the industries from disaster next winter unless stocks can be augmented. We are all waiting for information as to the likelihood of good result from the decision of the conference to place the position fully and plainly before the Government and members of Parliament, with the view to stirring the former to doing something really effective.

The Coal Conference.

The Fly in the Ointment.

Nothing could have been more peaceful and courteous than the conference; but the editorial writer of "Electrical Industries" could not in his comments keep his militant spirit under control, and so made some cavilling assertions, which were (in view of the occasion) in particularly bad taste, and in fact untrue. He says the demonstration of harmony was both temporary and superficial, and co-operation can only be regarded as confined to the coal question during the course of the war. It was the presence at the conference of Mr. H. E. Jones, the Chairman of the Gas Companies' Protection Association, that had an inflammatory effect on this writer, and caused him to run riot in his statements. He asserts that, "within the last week or two, the Association was instrumental in bringing about the destruction of the Yorkshire Electric Power Company's Act [it did not reach the dignity of an Act], which would have led to the introduction of electric light into rural districts." In their wildest dreams, those responsible for the conduct of the Association have not taken credit for effecting the happy dispatch of this particularly impudent measure. It was the extraordinary character of the measure itself—the setting at naught in it of the controlling powers that the Legislature insists shall apply to all electrical undertakings—that killed it; and the Board of Trade, the opposing local authorities, and the gas companies all of them objected to the Yorkshire Company having granted to them preferential terms in conducting an electric lighting business. The Company are not debarred even now from supplying the areas by merely obtaining authorization through Provisional Orders, and coming under general powers, as they are prepared to take up business in each area. Then "Electrical Industries" makes another altogether untrue statement. It says the "Association provided the funds for fighting the Long Eaton and the Ilford cases, in which the gas companies posed as the champions of legality, and succeeded in preventing municipal electric supply authorities from doing what they themselves happen to be free to do." It is true the Association lent their aid, through special knowledge of these matters, in preparing the cases; but that they footed the bills of costs as is suggested by "Electrical Industries" is untrue. It is also untrue that gas undertakings are allowed to practise undue preference in making charges for gas. The nature of the control placed upon them in this respect was stated in our issue for Nov. 10, p. 289. To the information then given, we—not for the first time—refer the editorial writer in our contemporary. It is also learned that his eyes are turned hopefully on a result of the conference other than the one its conveners had in view. He hopes that the momentary contact with the gas industry will (he does not state the nature of the subtle influence that is to bring this about) stimulate the Electrical Development Committee in preparing for operations on the scale of the British Commercial Gas Association. We have not the slightest objection, though, as said on other occasions, the extraordinary character given to electricity by its purveyors—a character which suggests that it is blessed beyond measure with all the essential attributes of a lighting, heating, and power agent, and has nothing to be set to its debit—should make a Development Committee totally unnecessary. But like people who know the real facts, the public are not prepared to take electricity at the valuation of its salesmen.

The L.G.B. and Loans.

In the industrial areas, there seems to be no difficulty on the part of municipal authorities in securing the consent of the Local Government Board to loans for gas and electricity extensions; this being no doubt in pursuance of the policy of the Treasury and the Board not to deny the spending of money in districts that are, through important factories, contributing to the supply of war material. It is just possible that in some of these areas there will be, when the pressure ends after the war, a rebound of the industrial comsumption of both gas and electricity, though for a period perhaps in some lines of production there will be a good deal of work forthcoming in replacing wastage and in providing fresh stores of material for the country's protection in the event of any untoward emergency. Just lately, the Local Government Board have, to quote examples, given their consent to loans for the Electricity Supply Department of the Leeds Corporation amounting to (roundly) £158,000; the Sheffield Corporation, too, have received authority to borrow for electricity purposes £134,373; Walsall has obtained sanction to a loan of £16,700; and Haslingden has been granted £4600 for mains and special trench work and £2770 for services, switch gear, and transformers. Down south the local authorities are not so fortunate. Their applications for loans are being refused, or, if considered, it is on the understanding that the spending of the money shall be dispensed with till after the war. This is the case with the Kingston-on-Thames Council, who made application for £11,000 to carry on their electricity concern the next few years. It seems strange that so many Councils, in connection with their electricity supply concerns, should still—despite the caution time and again given by the Local Government Board—continue the practice of spending beyond their authorization. Kingston has been doing so, to the amount of £5792; and the Board have asked for an explanation of this irregularity. The Watford Urban Council want more money for electricity purposes; but they have wisely decided to hold their hands until a more favourable occasion, and only ask

for authorization to the raising of money already expended. There will be trouble when they do this.

Electrical Precipitation of Smoke, Fumes, &c.

The "Electrical Review" has published an account of some papers read before the American Institute of Electrical Engineers, on the precipitation of smoke, fumes, &c., by electrical methods. Sir Oliver Lodge some years ago devoted his energies to the problem of the precipitation of fog by electrical discharges; but this was rather a big job in view of the space occupied by fogs. But the precipitation in industrial work of fumes and smoke from individual processes, or of matter held in suspension in gases, is quite a different proposition. We have had accounts, for instance, of the application of the electrical process to the deposition of tar held in suspension in town gas; and it is also believed that the cleaning of producer and blast-furnace gases will offer an important field for the system. These schemes are developments from the work that has been done by Dr. F. G. Cottrell and others, in subjecting gaseous mixtures to an intense electric field maintained between "collecting electrodes" and "discharging electrodes" for the deposition of impurities or suspended matter. In America, the process has been applied with good effect to quite a number of operations—for instance, in condensing sulphuric acid mist, and in depositing dust from the gas from rotary cement kilns. Experimental work has also been going on in many other directions—for instance, in separating water from crude oil. We will not quote all the fields of experimental work; but they seem to be almost limitless. In regard, however, to the elimination of black smoke, a boiler used for the testing of coals at the United States Bureau of Mines was fitted with a precipitator for this purpose. It consisted of twelve pipes, 12 feet long and 12 inches in diameter, through which the gases were led. The electrodes passed through the pipes placed vertically. With 1 kilowatt at 50,000 volts, the black smoke issuing from a chimney was rendered invisible. It is stated that the smoke can be precipitated readily; the apparatus using little power, and operating continuously with slight attention. In the case of a precipitator designed by Professor A. F. Nesbit and Dr. Strong, with 900 cubic feet of coal smoke issuing through the apparatus per minute, an instantaneous change was effected by the electric field. In this precipitator fine wires are stretched through 25 pipes, 4 feet long and 5 inches in diameter. The action of the precipitator is said to be due to the corona discharge from the electrodes. An alternating corona is found to precipitate about 50 per cent. of the suspended matter, the positive corona 70 to 80 per cent., and the negative 95 to 98 per cent. With hot air passing through the pipes and a negative corona, the breakdown voltage was about 32,000 volts; with cold air, the voltage was slightly greater; and, with a positive corona, the voltage was less in both cases. The breakdown voltage is about the same for cold smoke as for cold air; but with hot smoke the pressure had to be decreased to 28,000 volts. In the summary of the papers, nothing is said as to the cost. The real solution of the smoke nuisance will not be the electrical treatment of individual chimney shafts, but the displacement of smoke producing fuel by gaseous fuel or coke. The electrical treatment is interesting, but it adds to the cost of heating, is a roundabout way of overcoming a serious trouble, and could not possibly be universally applied.

NURSING AND GAS.

It was not surprising to find, on paying a visit to the Royal Horticultural Hall, Westminster, towards the end of last week, that the attendance at the Annual Nursing Exhibition, then being held, was hardly equal to what one has been accustomed to see on recent similar occasions. So many nurses at present have other and sterner work which occupies the whole of their time and attention. Yet at no time previously in the history of the country has such an exhibition been more opportune; for surely never before, since nursing became a science, has there been so much nursing to be done. Those who were able to go found, as usual, much to interest them, and to be of assistance to them in the exercise of their noble and self-sacrificing profession. To the great majority of the exhibits there is no need to refer specifically here; but with regard to one in particular, justice would not be done if it were passed over without a few words. It has not been necessary to be a professional nurse to become aware how great of recent years has been the progress made by gas in the sick room, and how generous has been the acknowledgment in medical quarters of the various advantages possessed by gas from a hygienic point of view. These matters are common knowledge. And since the war broke out, one has noticed, in both the technical and the general Press, frequent allusions to extensive installations of gas apparatus in connection with hospitals, &c. Gas, indeed, it may be said, is both the patient's and the nurse's friend.

No doubt it is some such considerations as those just quoted which induce the Gas Light and Coke Company to make it a practice to have a display at the Nursing Exhibition which always forms one of the main features of the show. It is an occasion which calls for a special effort; and so far back as memory serves one, the call has never been made in vain. A specially attractive exhibit has become the custom, and last week's display proved no exception to the rule. The hall, it should be added, lends itself admirably to such a purpose as a demonstration of the uses of gas; for it is possible to secure an annexe, of considerable dimensions, which, while entirely open in the front, is altogether apart from the main body of the hall. Here the Gas Company were found located once more last week, with as artistically arranged an exhibit as could be imagined. No trouble had been thing, from the beautiful flowers lining the steps leading to the annexe upwards, bore signs of having been carefully thought out. spared to captivate the eye and appeal to the mind; and every- The furniture and the fittings, of course, were excellent; and the scheme was in perfect harmony all through. No crowding was to be noticed anywhere; and so finished was everything, including the gas and water services, that it was difficult to believe the whole exhibit had been fitted up in two days—complete, as it was, even to the provision of windows to the rooms.

The centre of the annexe was arranged as a lounge, with ample facilities for the resting of weary visitors; and this part was lighted by a series of Sugg self-ventilating lamps. Round the annexe were four completely furnished rooms, comprising a bathroom, kitchen, dining-room, and bedroom; and all the lighting was by "Nico" burners, controlled by pneumatic switches. In some instances "Holophane" globes were fitted, and in others the burners were surrounded by delicate silk shades.

Glancing first into the bath-room, it was seen that there were a fitted bath and lavatory basin, supplied by Maughan's and Ewart's geysers; while on one side was a Wright gas-steam radiator, with a towel dryer. Hot water was also being provided by means of a Potterton gas-boiler to be found in the adjoining kitchen.

In the bed-room was a Wilsons and Mathiesons "Grand" fire, with one of the Pneumatic Gas Lighting Company's switches so arranged as to enable the fire to be lighted up by a person while still lying in bed. This appears at first sight to be a luxury; but there are very many cases in which it must be a distinct advantage. At the side of the fire was a trivet burner, for use for boiling a kettle, warming food, &c. A lavatory basin was provided with a hot and cold water supply. Over the dressing-table was a handsome two-light inverted burner pendant, admirably set off by pink silk shades. Other conveniences shown were Thwaites' bed warmers, Clark's curling-tongs, and an instrument sterilizer. These bed-warmers contain metal discs which are heated over a gas-ring and then placed in the cover; and when required for use by invalids it is now possible to get the warmer entirely enclosed in a wire case, so that no part of it can come in contact with the body of the patient.

As to the dining-room, the main feature of this was a Davis "Hercules" armour bright fire, with an elaborate mahogany overmantel and grey tiled surround; the whole of the handsome fitting having been removed for the purposes of the exhibition from the Oxford Street show-rooms of the Davis Gas-Stove Company. Over the dining-room table was a massive three-light polished brass Best and Lloyd fitting.

Now as to the kitchen. This was fitted-up with a Richmond No. 100 cooker, in ventilated tiled recess. It should be said that the value of this exhibit was much enhanced by practical demonstrations of invalid cookery undertaken by a nurse who on previous similar occasions has done good work for the Company. There was also a "London" coke-boiler, as well as a Potterton hot-water circulator, arranged to supply hot water to the bath-room, kitchen, bedroom, &c., as required. As to the Potterton gas-heated boilers, attention was drawn to the fact that eighteen of these appliances for supplying hot water to baths, &c., have been installed in the third London Military Hospital Wards, Wandsworth Common. Other articles in the kitchen comprised a Sugg eight-gallon wash-boiler, a Wright "Talisman" fire, a Forbes gas-heated water sterilizer, and gas-heated irons.

Masonic—Northern Star Lodge.

A most successful meeting of this Lodge was held last Friday at the Midland Hotel, Manchester, when Bro. James M'Ewen was installed W.M. for the ensuing year. The officers of the Lodge for 1915-16 subsequently appointed and invested were as follows:

I.P.M.	Bro. Thomas W. Jordan (Stockport)
S.W.	„ E. J. Wellens (Hebden Bridge)
J.W.	„ John Bond (Southport)
Chaplain	„ F. E. Moss (Wigan)
Treasurer	„ Walter Whatmough (Heywood)
Secretary	„ R. G. Shadbolt (Grantham)
S.D.	„ J. W. Morrison (Sheffield)
J.D.	„ Joseph Taylor (Bolton)
D.C.	„ R. Surtees (Burslem)
Organist	„ F. H. Lamb (Sale)
Assistant Secretary	„ E. O. Watson (Rawmarsh)
I.G.	„ T. Ousey (Higher Broughton)
Stewards	„ R. H. Garlick (Salford)
	„ H. Butterworth (Blackley)
	„ A. J. Harrison (Padiham)
	„ M. L. Williams (Stretford)
Charity Representative	„ J. W. Scott (Stockport)

At the meeting of the Institution of Municipal and County Engineers at Ayr on the 4th and 5th prox., Mr. James M'Fadzean, B.Sc., will read a paper on "Pressure Scraping Fifteen Miles of Water-Main."

UNIFORMITY IN GAS COMPANIES' BALANCE-SHEETS.

By "An Occasional Contributor."

The writer has under consideration each year or half year the printed accounts of many gas supply undertakings, and is struck by the variation which exists in dealing with the numerous items and statements.

It seems that it would be better to aim at greater uniformity, and that those secretaries or managers who leave out useful information might be persuaded to come into line, and follow a good lead, thus making their statements of very great value for purposes of accurate comparison. Those of us who are afflicted with a statistical tendency often unknowingly do some an injustice, by not having all the facts at our disposal. Correct figures would help statistical comparison, though figures without conditions are apt to be dangerous.

One readily understands that there are occasions on which the responsible person would like to hide certain particulars, and even at times would like to dispense with the statutory form. But the fact that most points referred to in this article are furnished to the compilers of directories, analyses, and comparative tables, encourages one to plead that they should be put on the printed statement of accounts. It seems strange that many items omitted from the printed accounts must always be supplied to the Board of Trade.

One of the most useful items in the revenue account is the gas sold (with corresponding money value) for various purposes and under various conditions—such as separate statements for ordinary consumers, slots, and public lighting. Generally, the two first-mentioned are merged into one for money purposes, and the amount of gas omitted altogether—sometimes to appear in the "statement of gas made, sold, &c."

Some undertakings supplying in several localities at varying prices show the income obtained at the varying rates; and this might with advantage be copied. Smaller concerns often omit the gas statement altogether. This is to be regretted, as the value of the whole account depends on the scale of the undertaking.

The gas "sold" for public lighting is often much in excess of that actually supplied; and the writer has seen the whole of the revenue from this source placed in the receipts for gas, whereas a considerable proportion of it was on account of lighting and maintenance. The best way of dealing with it appears to be to carefully estimate the amount of gas consumed; charge it at the determined rate; and, by difference, ascertain the cash value of the lighting and maintenance. This value should then be deducted from the amount actually spent on these objects, and the balance (if any) charged as an expenditure under "public lamps, labour and maintenance." A balance on the credit side might be put in miscellaneous receipts, or grouped with "maintenance of burners," if there is such an item.

What appears to be a fallacy is noticed in the majority of revenue accounts—viz., "discounts and allowances" on the debit side. Surely this should be deducted, and the net amount shown as receipts for gas; or else the discounts should be shown as a deduction on the credit side and the net amount carried out.

With regard to the cost of coal and oil, it would be useful to have this item dissected into coals, oil, coke, &c. If it is considered undesirable to make all details public, the last two might be grouped.

There is much variation in the placing of special charges in the revenue or net revenue account—thus complicating comparison with other results. It seems to the writer that any contribution to a special fund not associated with the usual routine and conduct of the business is essentially a charge on the net revenue. Conversely, if a sum is taken from the special purposes fund to meet any special payment or obligation, such sum should not be shown as a receipt in the revenue account, but credited to net revenue. [These remarks are scarcely meant to cover cases where Parliament has permitted contributions to special funds for prescribed purposes.]

Regarding rates and taxes, there is no unanimity in the method of charging income-tax. Sometimes it is included in this item; sometimes only the portion paid on the ordinary stock; and often all income-tax is put in the net revenue. This last appears to be the correct method; for as income-tax is based primarily on the profit shown on the face of the accounts, this profit should be the sum earned without deduction. Nothing is gained by it; for the inevitable query arises by the assessor as to what "rates and taxes" includes.

Returning to the revenue receipts, it is instructive and useful to shareholders to know the number of the ordinary consumers, stoves and fires, and automatic consumers. Some statements have this information attached to the corresponding cash receipts; others as a special table; most omit it altogether.

The receipts for residual products might well have the tons or gallons of each particular commodity attached to its item. The chaldron is misleading—consisting as it does in different parts of the country of 9 cwt. or 12 cwt. This point of tonnage, &c., is of importance, as it is often quite confusing in the "statement of residual products." In this table it is at times difficult to comprehend what is included in the "sold" column, and what in the "used;" and the confusion is worse if water gas is made. The coke for water gas might well be noted as a separate residual product receipt (in its absence from the coal and oil expenditure statement), for the tonnage is sometimes shown as "used," but more often as "sold." So long as it is isolated, it does not much matter where it appears. Again, this item often comprises coke used in generators, and excludes that which is used in the carburetted water-gas boilers.

Coke used for the generation of steam for cranes, coal-handling plant, exhausters, and other machinery, should be charged under their respective heads, and be credited in the residuals receipts, and placed in the statement as "coke sold." Similarly, breeze and tar used on the works for road making, levelling, and like purposes, should be charged to wear and tear and credit taken in residuals.

Sundries, which are actually residual products—such as retort-carbon, "asphalte" (made from breeze and tar), clinkers, &c.—should be placed to residuals; whereas the writer has often seen them placed in "miscellaneous receipts" because there happens to be no named item in which to place them, instead of creating a "sundries" item under residuals. In short, any product actually turned out of the retort-house should have a corresponding credit; so that the engineer or manager may not only know exactly his net coal costs, but may receive due credit for the actual results achieved.

A useful piece of information often given is that of the actual deductions on account of labour and cartage for each residual. This enables the average gross price to be obtained. And while on this subject, a protest might be entered against the unfair habit of charging coke to the water-gas plant at many shillings above its normal yard price, in order to swell residuals receipts, or for some other futile reason. It is of the utmost importance for the engineer to know at any time the relative costs of coal gas and carburetted water-gas; and this cannot be fairly calculated when these fictitious coke rates are introduced.

The habit of gradually accumulating a large stock of surplus coal by booking more than is actually carbonized—thus showing less than the actual in the "stock" column—appears to be of no benefit. A small fixed surplus is of value to make up for inferior consignments; but the writer cannot see any advantage to anyone in gradually increasing this surplus, to the detriment of one's paper results. Often a successor reaps the benefit. To such lengths is this faking carried that the writer has known the actual meter readings of the two gases "amended" in order to give the makes per ton, per mouthpiece, or per gallon of oil, at whatever figure it is thought necessary to produce.

The methods of stating the net revenue account are many. The simplest and most comprehensive to the layman is that adopted by a large number of undertakings—namely, the credit side consisting of the balance brought forward from the last account, with the dividend since paid deducted—*i.e.*, the dividend earned during the period covered by the preceding account. This gives the amount remaining immediately after the dividends are paid; and to it is added the amount transferred from the revenue or trading account. On the debit side appears, first, any adjustment necessary for income-tax payments. Then are shown interest on mortgages, deposits, loans, and debentures, with deductions for income-tax (if necessary). The remaining balance is then available for the dividend to be declared at the meeting called on the statement in question. If any contribution is made to a special fund, it is debited, or if any amount has been taken from such a fund, it is credited.

Returning to the "statement of gas," it is peculiar to observe the traditional use of the word "common" in the column "description of gas." Sometimes all the gas is called "common" (perish the thought!), and at others the name is applied to the straight coal gas, while the full title is given to its aristocratic colleague. Surely this description column should now be used for the differentiation of the gases; otherwise the statement loses much of its value. The academic feature of taking gas into stock and adjusting for it might well be abolished; for assuming that a full stock is taken on one occasion, and *nil* on the next (the limit of difference), the error would not be more than $\frac{1}{4}$ or $\frac{1}{2}$ per cent. In sheets examined by the writer, it has never exceeded 1-25th per cent.; for it must be remembered that the respective stocks are taken at the same hour of the day.

With regard to capital expenditure, it seems desirable that all new plant, or increase in power of plant, should be placed to capital direct, and reduced by way of depreciation. [The term "new" plant is not intended to cover that purchased in order to replace worn-out articles.] The depreciation allowed by the income-tax authorities is usually ample to cover any contribution from the revenue which the account can afford; and by doing it in this manner accurate book values can always be ascertained. In many concerns this allowable depreciation amounts to 5d., 6d., or even more per 1000 cubic feet sold—giving a generous and elastic margin above the money legitimately expended in repairs.

In small undertakings carrying little stock, a lot of trouble is saved by charging all stores direct to capital or revenue, with their allocation immediately on purchase. The sundry stores are then only taken for checking purposes, and need no valuation for balance-sheet purposes.

Among other infomation printed in the accounts, the increase in the sale of gas over the corresponding period of the preceding year is useful; and if a half-yearly statement, the sale for the year so ended might be added.

In addition to the dividends recommended, the directors' report

might always state any change in the price, the date at which it takes place, and its effect on the dividend if it is a sliding-scale company.

There are other minor points of difference—particularly with regard to small concerns. But the writer has introduced sufficient food for reflection; and although these remarks are offered in no dictatorial spirit, yet if anyone concerned can see his way clear to adopt any of them it would tend to bring everyone to the same basis of comparison, which, after all, is the object of all statistical investigation. As far as can be seen, their adoption would inflict no injury on officials, shareholders, or consumers.

TURBO-DRIVEN GAS-EXHAUSTERS.

An Installation for the Tottenham District Light, Heat, and Power Company.

In view of the attention that has been devoted to the subject of turbo-driven exhausters for gas-works use, it is of interest to note that an order has recently been received by the British Thomson-Houston Company, Limited, of Rugby [whose installation at the Windsor Street works of the Birmingham Corporation was illustrated in the "JOURNAL" for Feb. 10 last year], from the Tottenham District Light, Heat, and Power Company for two of these machines.

The two exhausters for Tottenham are capable of dealing with 200,000 cubic feet of town gas per hour, and of developing a vacuum on the suction side equal to 4 inches water-gauge, and delivering against a pressure of 48 inches water-gauge. The turbo exhausters have water-cooled bearings, and are fitted with special gas-tight gland packing, which remains tight even when the exhauster is at rest. The exhauster is mounted on a baseplate, and coupled direct to a single stage "B.T.H." turbine. The governing of the turbine is entirely under the control of a float-governor supplied by Messrs. G. Waller and Son, of Stroud.

The chief feature of this type of exhauster is that it maintains an absolutely constant suction pressure within an extremely small range of variation of pressure. In order to maintain this constant suction pressure with varying quantities of gas delivered, the speed of the turbine is varied within very wide limits; but it is all done automatically by means of the governor. The actual suction pressure can also be varied by a special adjustment on the governor. This adjustment is carried out by a simple process of adding or taking away balance-weights. A suitable tachometer is also supplied for indicating the speed of the turbine; and the turbine is protected by means of an automatic trip-gear, which comes into operation should the speed rise above a predetermined safe limit, which is generally reckoned about 12½ per cent. above the maximum speed for which the turbine and exhauster are designed. The turbine exhausts at atmospheric pressure; and the exhaust is used for other processes connected with the manufacture of gas.

These gas-exhausters are inexpensive compared with other types. There is a minimum quantity of lubricating oil required, which is only used on the running journals; all other internal parts working quite free, and therefore not requiring any lubricant. The wearing parts are entirely confined to simple journal bearings; and this feature renders the device eminently suitable for long runs without stoppage. In fact, they have been known to run for six months, night and day, without a single stop.

UNIT OF CANDLE POWER IN WHITE LIGHT.

In the "JOURNAL" for the 13th of April (p. 69) it was recorded that a paper by Messrs. CLIFFORD C. PATERSON and B. P. DUDDING, bearing the above title, had been read by the latter at a meeting of the Physical Society. The principal object of the authors was to describe the methods adopted at the National Physical Laboratory for minimizing the difficulty of photometric comparison of white lights of different hue; and the following particulars of their investigations are taken from an abstract of the paper in the "Electrician."

THE "CASCADE" METHOD.

The course followed by the authors was to interpose between the Harcourt pentane lamp and the high-efficiency sub-standards five additional sets of lamps, each varying from the next in efficiency, or operating temperature, by such an amount that the difference in the hue of their radiations constitutes a regular colour gradation in approximately even steps from the pentane colour up to that of the 1·5-watt per candle tungsten filament standards. By standardizing each set of sub-standards against the set below it, it is possible to arrive at a value for the final set by a series of photometric comparisons in each of which the colour difference, although perceptible, is too small to seriously trouble an observer with normal sight. The photometric work involved in the investigation was laborious. In order to eliminate any uncertainties of individual lamps and to reduce the probable error, each of the six sets of lamps consisted of ten or twelve lamps, and each set was compared with the next one, in order of colour, some six or eight times by each observer. This entailed in all between 2000 and 3000 standardizations, or between 10,000 and 15,000 observations. The work was started several years ago; but the difficulty experienced at first in obtaining metal filament standards which were sufficiently constant caused much delay in the early stages.

Six sets of sub-standards and five comparison lamps were used. Set No. 1 was a series of 11 sub-standards, the radiation of which matched in hue that of the pentane lamp, or the radiation from a black body at 1610° C. Set No. 2 was a series of 11 Fleming-Ediswan sub-standards operating at an equivalent temperature of 1700° C. This set was compared against No. 1 by the usual substitution method of photometry, using a Lummer-Brodhun photometer, and a comparison lamp, the colour of the radiation of which lay midway between that of Nos. 1 and 2. In a similar way, set No. 3, with an equivalent temperature of about 1750° C., was compared against No. 2 through another comparison lamp, which also divided the colour difference, and so on to set No. 6. It will thus be seen that by such a substitution method as this the colour difference between Nos. 1 and 6 is divided into ten approximately equal steps—that is to say, at any one measurement there is only a colour difference of one-tenth that of the difference between the sets. The difference of colour in the photometer throughout the investigation was, therefore, never greater than that resulting from a difference of temperature of about 45° C. All the measurements were made with an illumination at the photometer screen of 10 metre-candles. Having by this means, and for each observer, assigned candle-power values to each of the lamps in set No. 6, the latter were compared in one step with set No. 1. It is of interest to note that the colour of the radiation from melting platinum is the same as that of set No. 3.

ABSOLUTE VALUE OF THE CANDLE-POWER UNIT.

The absolute values of candle power of sets Nos. 1 and 2 have been assigned to them respectively by two independent comparisons with the Harcourt 10-candle standard lamp. Set No. 2 was compared against the pentane lamp in 1904-6. At the time the determination was made, their colour formed a suitable intermediate step between that of the pentane lamp and the usual light sources which had to be tested. After eight years' use of these lamps, and in view of some small unexplained differences between the National Physical Laboratory unit and that determined in other quarters, it was considered desirable to realize the unit anew. Set No. 1 of the sub-standards was therefore prepared, the light of which was identical in colour with that from the pentane lamp, and compared against the pentane standard in the usual way over a period of about two years (1912-14). It is satisfactory to find, from the subsequent intercomparison of sets Nos. 1 and 2, that the unit of candle power realized on these two different occasions, separated by a period of eight years, agreed with each other to within less than 1 part in 1000.

FINAL CANDLE-POWER VALUE.

The authors go on to discuss the order of agreement between different observers in the final candle-power value obtained for the high-efficiency lamps (set No. 6) by the "cascade" method and by comparison in one step. They also deal with the accuracy to which photometric readings of this description are repeated by any observer, and the probable errors of the results. The following table gives the probable errors of the various stages of the "cascade" and direct comparisons.

Comparison.	Probable Errors.			Total Probable Error in Mean of Set.
	Bench Error.	Day-to-day Error.	Error due to Differences between Observers.	
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Pentane lamp against Set 1 .	0·01	0·05	0·00	0·05
Set 2 against Set 1	0·01	$0·03_5$	0·15	$0·15_5$
,, 2 ,, ,, 2	0·01	$0·03_5$	$0·04_5$	0·06
,, 4 ,, ,, 3	0·01	0·04	0·12	0·13
,, 5 ,, ,, 4	0·01	0·03	0·11	$0·11_5$
,, 6 ,, ,, 5	0·01	0·02	0·04	$0·04_5$
Total probable error by the "cascade" method, Set 6 against Set 1	0·02	0·07	0·23	0·24
Do., by direct method, Set 6 against Set 1	0·02	0·06	$0·22_5$	0·23

Having fixed the value of the unit in white light by the "cascade" method, it became of interest to know what order of agreement existed between it and similar units evolved at the National Laboratories of France, Germany, and the United States. The following table shows the value of the National Physical Laboratory unit in terms of that of the Reichsanstalt, the Bureau of Standards, and the Laboratoire Central, deduced from the mean of all the lamps tested:—

—	Ratio.	Difference from Accepted Value.
Bureau of Standards /N.P.L.	$1·00_{35}$	+ 0·35 per cent.
Reichsanstalt /N.P.L.	$0·90_{02}$	0 0
Laboratoire /N.P.L.	$1·00_2$	+ 0·2 ,,

A higher accuracy than 0·25 per cent. cannot be claimed for these intercomparisons, and the results therefore show that, within the limits of the experiment, the units of candle power at the four laboratories realized in lamps operating at 1·5 watts per candle are in virtual agreement. The chief interest of the result lies in the fact that different methods were used at the several laboratories for carrying out the comparison.

Redetermination of Constants of the Pentane Lamp.

The second realization of the unit of candle power from the pentane lamp has afforded an opportunity of re-examining the constants of this lamp in regard to changes of humidity and barometric pressure. The comparisons extended over two summers and winters, and by this means as wide a range as possible of humidity was secured. The conditions for the use of the lamp were similar to those existing previously, except that a larger number of observers took part in the measurements, and there was no colour difference between the light from the pentane lamp and that from the sub-standards compared against it. From the results the authors conclude that if work of the very highest accuracy is to be carried out with flame standards under abnormal humidity conditions, the combined "humidity-temperature" coefficient should be determined for the locality in which the work is to be conducted. It should be pointed out that the difference between the American and English determinations for the pentane lamp amounts to less than 1 per cent. in candle power for a rise of humidity of 10 litres per cubic metre above the normal. Values have seldom been observed greater than this in Teddington. A table by Crittenden and Taylor shows the average humidities in Boston and New Orleans to be 9·9 and 19·1 litres per cubic metre respectively. Where such large differences exist in climatic conditions, it is considered that the question of the variation of the combined "temperature-humidity" co-efficient might with advantage be further investigated.

MANUFACTURE OF CONCENTRATED GAS LIQUOR.

An article by R. W. Hilgenstock, of Düren, in a recent number of the "Journal für Gasbeleuchtung" points out that gas-works and oven-coke works in Germany have been compelled, by the scarcity there of sulphuric acid, consequent on the diminished importation of pyrites and sulphur, to work-up their gas liquor to concentrated liquor in place of sulphate of ammonia. Herr Hilgenstock proceeds to refer to the methods of production of such concentrated liquor, which he divides into two classes—viz., (1) a poor concentrated liquor containing from 14 to 16 per cent. of ammonia; and (2) a concentrated liquor containing from 16 to 30 per cent. of ammonia. It is for the production of the latter that special plant is indispensable.

The poor concentrated liquor is produced by passing the vapours from the ammoniacal liquor, which ordinarily enter the saturator, into a concentrating condenser. This condenser is constructed entirely in cast iron. It consists of a number of trays, each of which contains a cooling cup or cell of special construction which is cooled by water. The ammoniacal liquor vapours strike the upper surfaces of these cups, and are condensed on them. The liquor which is about to be worked-up can be used as the cooling medium for these cups; thus making the condenser serve as a preheater for the liquor, whereby a considerable economy of steam in the distilling column is effected.

The author refers to the plant constructed by one firm of German manufacturers for the production of poor condensed liquor, which comprises two distilling columns, in the first of which the volatile ammonia is driven off, while in the second the fixed ammonia compounds are decomposed by milk of lime. The vapours from these columns are passed into the concentrating condenser, and the condensate flowing away from the lowest tray passes through an overflow in which is a hydrometer for indicating the strength of the liquor. The concentrated liquor then passes into a separator in which light oil derived from any tar present in the liquor is removed. In order to avoid any loss of ammonia with the escaping air which has come over from the still, a small washing apparatus is provided, through which the gases pass. The weak liquor obtained in this washer is returned to the liquor stills. Ammonium carbonate is liable to separate from the concentrated liquor in the storage tank, tank-waggons, and sometimes even in the concentrating condenser. To bring the ammonium carbonate into solution again by warm water presents difficulties, and may involve putting the whole apparatus out of action for a time. To avoid this trouble a considerable proportion of the carbonic acid can be first removed from the gas liquor. This may be done either by means of milk of lime or by decomposing the ammonium carbonate in the liquor by heat. The first method involves a great increase in the amount of waste lime. The removal of carbonic acid by heat is carried out in an apparatus in which a regulated stream of the gas liquor is passed into the upper trays of an elevated extractor in which from 60 to 70 per cent. of the carbonic acid is driven off. The liberation of carbonic acid occurs at a temperature above 90° C., at which temperature a certain proportion of the volatile ammonia also is driven off from the liquor. The ammonia is absorbed by the washing trays, and the carbonic acid passes on to the open air. The decarbonated liquor is then delivered on to the upper trays of the distilling column, and is worked-up in the manner already described. The ammoniacal liquor vapours are, however, first passed through a reverse-flow condenser, in order to condense as much steam as possible; and the resulting condensate flows back into the distilling column. Thus a high percentage condensate is attained in the concentrating condenser. If the carbonic acid extractor is placed on the ground instead of above the distilling column, a pump must be provided to lift the decarbonated liquor to the top tray of the distilling column. With apparatus of this kind, the author states that concentrated liquor of any strength up to 30 per cent. of ammonia can be produced. It is, however, best, with a view to avoiding losses of ammonia, to make a product containing from 20 to 22 per cent. of ammonia.

THE LIGHTING OF RIFLE RANGES.

The subject of the lighting of rifle ranges was discussed at the meeting of the Illuminating Engineering Society last Tuesday. It was introduced by Mr. A. P. Trotter, who had prepared a series of ten questions to indicate the lines the discussion should take. Those specially relating to lighting were as follows: (2) Assuming that artificial lighting is employed, should this be used mainly or solely to illuminate the target with the object (rightly or wrongly) of simplifying the conditions and making them easier? (3) Do these artificial conditions of lighting conduce to skill in a specialized and artificial type of shooting? (4) Assuming that the light is concentrated solely on the target, and that conditions for highest acuity of vision of the target are desired, what is the best degree of illumination? Does an excessive illumination lead to "irradiation"—*i.e.*, an apparent encroachment of the white surface over the black bull; if so, what should be the permissible illumination to avoid this effect? (6) Does concentration of light on the target and darkness in other parts of the range, resulting in the enlargement of the pupil of the eye, have an effect on acuity of vision (*a*) of the target (*b*) of the sights? (8) Is it agreed that sources of light used to illuminate the target should be completely screened from view? Is it better to have the surroundings comparatively dark or to have a more moderate contrast between surroundings and target? Is there any general understanding as to whether results by artificial light are better or worse than those obtained in daylight? (9) Is it desirable to attempt to produce conditions of light similar to those existing out of doors? If so, what steps should be taken to imitate these conditions? (10) What special lighting arrangements, if any, are desirable to facilitate the observation and recording of results and the manipulation of targets from the firing end?

In introducing the subject, Mr. Trotter explained that he had had some acquaintance with the science and technology of illumination, and with the elementary physiology of the eye, but he had accepted the invitation to start the proceedings not because he was an experienced rifle shot, but, on the contrary, because he had encountered such difficulties that he could perhaps present them for consideration more vividly than one who was a good marksman, and who only heard of these difficulties from his pupils. He then offered some general remarks on shooting, and dealt with the questions he had prepared.

As to to the second question, Mr. Trotter said opinions probably differed about the use of artificial light, for nothing but a definite demand could have led to the careful exclusion of light from most of the miniature ranges. The probable reason for this was that other lights than the carefully concealed ones which light the targets would cause glare unless they were evenly diffused. As to the fourth question, a target might be too brilliantly illuminated; but the disturbing effect seemed due to glare rather than to the apparent reduction of the diameter of the bull's eye by irradiation. The sixth question was as to whether concentration of light on the target and darkness in other parts of the range, resulting in the enlargement of the pupil of the eye, had an effect on acuity of vision of the target or of the sights. He thought that, provided the target was not too brightly illuminated, surrounding darkness probably helped as far as the target was concerned. The reply to the first part of the eighth question undoubtedly was that sources of light should be screened from view. A light over the heads of the marksmen probably led to low shooting. The last part of the question, as to whether the results obtained by artificial light were better or worse than those obtained in daylight, should be answered by those who had had much wider experience than he. His reply to the ninth question was that it seemed desirable to attempt to produce conditions of light similar to those existing out of doors, so far as diffusion of light was concerned. This should be quite practicable.

Sawdust as a Fire Extinguisher.—As an extinguisher of small fires of oil or grease, sawdust is considered to be much superior to either sand or water. Sawdust, wet or dry, thrown on a blazing liquid has a blanketing action, floating on the surface and keeping out the air, so that it actually smothers the flame. Sand is less effective, as it sinks through the liquid. The efficiency of sawdust may be increased by mixing it with sodium bicarbonate, using 10 lbs. per bushel of sawdust. The bicarbonate liberates carbon dioxide when heated, and this gas smothers the flames. Sawdust is more suitable in cases of fires in electric plant, as it is easier to handle, and spreads more readily than does sand.

WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.

General Meeting of Members in Cardiff.

Owing to the troublous times through which the country is passing, the Institution decided not to hold their customary meeting last September; and therefore, when the members gathered at Cardiff last Thursday afternoon a year had elapsed since they had had a general meeting. Like the one just held, the previous meeting took place in Cardiff, where the warmest of welcomes at the hands of the Gas Company invariably awaits them. Unhappily, death had in the interval forced a change in the chairmanship of the Company; but the members soon found that it had made no difference in the cordiality of their reception. The gatherings at Cardiff, which is a central spot, are always successful; and the attendance last Thursday—especially considering the stress under which work is now being carried on by gas undertakings, as well as by other industries—was particularly gratifying. Useful discussions, and the reading of a paper prepared by Mr. W. C. Jackson before he left Merthyr Tydfil for the position he now occupies at Neath, provided plenty of occupation for the afternoon's business meeting; and this was supplemented afterwards by more informal chat over the tea which was kindly provided by the Chairman and Directors of the Gas Company. Along with the remembrance of all the hospitality they have received from the Cardiff Gas Company, the members will surely bear in mind the exhortation of the Chairman (Mr. Charles E. Dovey, J.P.) to "Come as often as you like."

The business was transacted in the Gas Company's Offices, in Bute Terrace, which had once more been placed at the disposal of the Institution for the meeting. At the opening of the proceedings, the chair was occupied by Mr. H. D. Madden, the Engineer to the Cardiff Gas Company, and the outgoing President. He subsequently introduced his successor, Mr. A. W. Branson, of West Hartlepool. Among those present during the proceedings were Mr. Charles E. Dovey, J.P. (the Chairman of the Company), Mr. Morgan Lewis (a Director), Mr. George Clarry (the Secretary and General Manager), and Mr. W. M. Mason (the Secretary of the British Commercial Gas Association). There was an attendance of probably over fifty members.

Minutes of the Last Meeting.

The Hon. Secretary (Mr. Octavius Thomas, of Pentre) read the minutes of the last general meeting; and they were confirmed.

New Members.

On the proposition of Mr. J. H. Canning (Newport), seconded by Mr. A. E. Davey (Aberdare), there were elected as members of the Institution Mr. W. H. Cattell, of Swansea, and Mr. Barton Grainger, of Caerphilly.

Apologies for Absence.—The Benevolent Fund.

The Hon. Secretary said that among the apologies for non-attendance was a letter from Mr. John Bond, the President of the Institution of Gas Engineers, who expressed regret that another engagement prevented him being present. Mr. Bond added: "I am pleased to note that your President and Council are making a special appeal to your members to support the Benevolent Fund of the Institution of Gas Engineers. I can with confidence state that subscriptions are urgently needed, and will be faithfully applied in connection with many distressing cases which have come before the Benevolent Fund Committee."

The New President.

Mr. Madden said the time had now arrived for him to introduce the President-elect, Mr. A. W. Branson, of West Hartlepool. In doing so, it was not necessary for him to tell them anything about Mr. Branson, who had become well known to all of them during the years he had spent at Caerphilly. The one thing they regretted was that he had now left the district and gone away to the North. He would like to congratulate both Mr. and Mrs. Branson on the marvellous escape they had during the bombardment of the Hartlepools.

Mr. Branson (who, on taking the chair, was greeted with applause) said his first duty was to move a very hearty vote of thanks to Mr. Madden for his services as President during the last year-and-a-half. His deep interest in the Association was like that of the Cardiff Gas Company—most helpful. They had always held a very high opinion of Mr. Madden as a brother engineer, and beforehand knew how well he would fill the office of President.

Mr. Thomas Canning (Newport) seconded the vote, which he said was exceedingly well deserved. He knew Mr. Madden well, and from the first had no doubt whatever that he would make an excellent President. With so much to occupy him, it had been very good of him to devote so much of his time to the Institution. He was a first-class engineer, and had freely given them the benefit of his experience.

The vote was cordially agreed to, and briefly acknowledged by Mr. Madden.

Annual Report and Accounts.

The Hon. Secretary then read the annual report of the Council, which stated that during the year two members had joined the Institution, one student had been transferred to membership, one member had died, and one had resigned. This made the number sixty-eight members and two students at the end of the year. Owing to the war, the Council did not think it possible to hold the September meeting last year. Copies of the "Reports of District Associations" for 1914 had been sent to all members who had paid their subscriptions. The Council recommended the re-election of the existing officers for the ensuing year. The accounts showed an amount in the Treasurer's hands of £35 13s. 11d.

The report was adopted, on the proposition of Mr. L. J. Langford (Abertillery), seconded by Mr. R. A. Browning (Neath).

Re-Election of Officers.

Mr. G. Clarry (Cardiff) proposed the re-election of the officers. He said it was a very good list; and they had been working under exceptional difficulties during the past year. The Institution could not therefore do better than re-elect them.

Mr. J. H. Canning seconded this proposal; and it was agreed to.

The Bombardment of the Hartlepools.

The President, returning thanks for the honour that had been conferred upon him by electing him to this position, said it came as a very pleasant wind-up at the end of the busy years he had spent among them in South Wales. It had been decided by the Council that his address should be given at the September meeting—a decision which he might say he was not at all sorry to hear. He wished to thank Mr. Madden, too, for what he had said about his escape in the bombardment. It occurred to him that it might be interesting to the members if he referred to this matter in some detail. All sorts of trials and difficulties had presented themselves to the gas manager since the war had begun—with in many cases more work and fewer to do it—so that his life had not been a bed of roses. His own experience had been no exception to this; and he was glad to be relieved for the time being of the duty of preparing a Presidential Address. The works of the Hartlepool Gas and Water Company had the unenviable distinction of being the first British gas-works to be bombarded with shell; and as it was doubtful whether any gas-works could be considered as perfectly free from the menace of bombs from air-craft, although there might be no danger of a bombardment, a few words as to the Hartlepools bombardment—more particularly referring to the gasholders—might not be out of place. Many of them probably would remember an interesting article by an expert which appeared in the Technical Press about two months ago, on the subject of aërial bombs and gasholders, and what might happen and what to do. All through, the writer evidently had in his mind the danger of flames sucking-back into the holder when the gas was on fire, and an explosion occurring. This was a fear one would naturally have; and therefore the writer said that care should be taken to keep a sufficient flow of gas going into the holder to prevent the flame sucking-back. This, for several reasons, was an impossible precaution for them to take at West Hartlepool. For one thing, the retort-house mains were pierced with shell, and would have drawn air in, and just caused the trouble they were seeking to avoid. Yet, though the inlet and outlet valves were closed in each case, all three holders landed on the rest-stones, and burnt out without any explosion occurring. In the case of one holder, a three-lift one, of 1½ million cubic feet capacity, the plates were white hot; and as it descended into the water the volumes of steam probably helped to extinguish the flame and clear the crown of gas. In the case, however, of the second largest holder, a two-lift one, of 750,000 cubic feet capacity, the flames continued under the crown for over two hours before they were extinguished; water being played on them with hose-pipes the whole time through the rent in the crown. In the case of the third holder, a three-lift spiral-guided one, of 500,000 cubic feet capacity, the flames were soon out, being extinguished as the holder descended into the water. The shell-holes were all in the side sheets, and it was only one lift out of the water. With the two-lift holder, the flames burned under the crown for the time he had mentioned, and yet no air was drawn in, as the writer of the article evidently felt certain would have happened. Experience showed, therefore, that there was not the danger from explosion that one would have imagined in the case of gasholders fired by shell or bombs. At the same time, if it had been possible to keep up a flow of gas into the holder, and prevent it from grounding while attempts were made to extinguish

the flames, it would be a wise precaution. As to the possibility or otherwise of extinguishing the flames of a burning gasholder, if the holes were all in the side sheets the chances were that the flames would be extinguished by the water in the tank, unless the holder stuck in its descent; but if the holes were in the crown, they would, in his opinion, have to be very small in order to deal successfully with the flames. He would not take up their time further with details of the bombardment; but there was just one other point which might interest the members at the present moment. Though the works were shut-down for 58 hours, the street-lamps in the higher part of the town remained alight; and a number of people informed him that they were not without gas sufficient to give a useful light during the whole of the time. This went to show that a military order to turn off the gas would not in many towns put out all the lights. On the North-east coast they had had quite a battle on the subject of turning-off the gas at the works; and the Military Authorities had decided upon lowering the pressure to 5-10ths. He would like to take this opportunity of referring to the late Colonel Fisher. Amidst many other interests, he was keenly concerned in gas matters, being Chairman of four South Wales gas undertakings; and he was ever ready to consider a new development or proposal of a progressive character on the works or outside. Some of them were privileged to be associated with him in business, and had much to thank him for; but he made himself known to practically all in his happy way on these occasions when the members were the guests of the Cardiff Gas Company. His death was a loss to the Institution and the gas industry generally. They remembered his hearty welcome there only twelve months ago, and his cheery company at the luncheon-table; and it was particularly sad to reflect that he was now gone. He did not know whether the Council had done anything in the matter.

The Hon. Secretary said a letter of sympathy had been sent to Mrs. Fisher.

The Special Purposes Section.

The fourth annual report of the Special Purposes Section stated that the membership now extended to 23 undertakings. Among the subjects which been dealt with during the year ended September last were the prices of coke and other residuals and the advance in the prices of gas-stoves. It was stated that evening classes for gas-fitters had been held at Cardiff, Newport, and Pontypridd, and were well attended, with satisfactory results.

Mr. T. H. Hazell (Newport), in moving the adoption of the report, said it was rather surprising to members of the section when they got to work to find how many different subjects there were of interest to the industry generally, and how many phases there were of questions relating to (say) residuals. There were different phases of dealing with coke, tar, liquor, sulphate, and so on. He thought the section justified its existence during the past year, if it dealt with only one of these different subjects. He well remembered attending some of the meetings when members were in a very doleful mood indeed, speaking of the mountains of coke that were heaping-up so extensively; and at one time they had no idea as to what was going to be the upshot of the storage of coke. Later on, there came a gleam of sunshine, brought about, he thought, by their friend Mr. Clarry, who told them there was a boom coming. They could not see many signs of it at that particular time; and some were a little bit inclined to doubt that the boom was really coming. In a short time, however, it was discovered that there were inquiries for coke, which in due course developed into orders, and orders into more extensive orders; and he supposed that at the present time those who possessed coke in store were to be considered as among the lucky members of the Institution. Then, in regard to tar, he believed "a still tongue made a wise head;" but several of them had learned something surprising about the manipulation of tar and tar prices, on which they would do very well to ponder, and seek, if not their own counsel, the counsel of others, to aid them in doing the best they could for their undertakings. He thought on the whole the work of the Special Purposes Section had been very well done during the year. There was one question which was absent from the report—it might perhaps be because it had been nobody's business to mention it. He had once or twice asked whether it would be a desirable thing for those connected with the Institution to consider their position, under the condition of things brought about by the war, in regard to the price of gas. He did not know whether it had been the case with other Associations that members had discussed the matter for the purpose of arriving at some feasible plan of determining the method of announcing the rise and the amount of increase—because he supposed throughout the whole of the district they were all in the position that they would have to increase the price of gas. If not, would it be possible for members to meet together and decide upon the amount of the rise that it was necessary to impose, and the form in which the notice should be given? He did know of a case where competing concerns—the corporation electricity undertaking and the gas company—had for the moment put aside their hostility to the extent of devising means to prevent each cutting the other out, and arranging that there was to be a mutual announcement of a settled increase in the price of their commodities. He thought this was perhaps a very good precedent, and one that might be commended to any members of the Institution who were placed in the like position of having a competitor whom they could possibly for the moment make a friendly competitor. It had been done, he knew, with success; and he took it the announcement would be made shortly by both undertakings, if not in one advertisement, in two advertisements on the same page of a local newspaper.

Mr. R. G. Clarry (Swansea), in seconding the proposition, said Mr. Hazell had shown that there was good justification for the existence of the Commercial Section.

The President said he thought that if at any time the Special Purposes Section was needed, it had been during this abnormal period. He had found it particularly helpful to him. With regard to Mr. Hazell's point about co-operating with electric light people on the matter referred to, this might be useful. In his own case, the Corporation approached his Company in January, saying they thought of raising the price of electricity if the Company would raise the price of gas; and, in their innocence, the Company replied that they would have to do so. Now he found that the Corporation had decided not to do it. [Laughter.] So they had to remember that this was the sort of thing they might be let in for. Of course, they had to raise the price of gas, whatever the electric light people did. The Corporation happened to have made a profit of £75 for the year, and no doubt this obviated the necessity for any advance.

The report was then adopted.

Subscription to the Gas Institution Benevolent Fund.

The President, introducing the matter of a subscription to the Benevolent Fund of the Institution of Gas Engineers, remarked that they had heard Mr. Bond's letter read; and they knew the fund was a deserving one.

Mr. Madden proposed that the Institution contribute two guineas to the fund. He pointed out that this had been their practice for some years past; and he thought he might appeal for individual subscriptions in addition to the sum he had named. There were, he knew, a great many members who already contributed to the fund; but they would like to see every member of all the District Associations doing so. At the present time, the fund was running rather low; and there were many cases to meet.

The Hon. Secretary seconded the proposition, which was agreed to.

Notes on Gas Sales.

Mr. W. C. Jackson (then of Merthyr Tydfil, now of Neath) had prepared a year ago a paper entitled "A Few Notes on Gas Sales;" but owing to lack of time, it had to stand over until this meeting. In the absence of the author, it was read by the Hon. Secretary. The paper was given in the "Journal" for June 9 last year [pp. 714-7]; and a report of the discussion will be found on p. 452 of this issue.

Toluol—Place of Next Meeting.

After an informal discussion on the toluol question, it was decided that the place of next meeting should be left to be fixed by the Council.

A Vote of Thanks.

Mr. T. Canning proposed that the best thanks of the meeting be given to the Chairman and Directors of the Cardiff Gas Company for the use of their offices and for their hospitality. The present Chairman, Mr. Dovey, was no stranger to them; for he had been with them at many of their meetings, and had shown the greatest interest in the proceedings. He had, too, always welcomed them to Cardiff, along with his two predecessors, to whose memory he (the speaker) wished to refer for one moment. They had all an affectionate remembrance of the great kindness of Dr. Taylor, and the equal kindness they had experienced at the hands of Colonel Fisher. They regretted very much the loss of these gentlemen, and all hoped that their successor, who had now taken upon himself a no small burden in the chairmanship of the Company, would be long spared. There was not one of the members of the Institution who did not wish well to the Chairman, Directors, and officers of the Company. He trusted the prosperity of the undertaking would be as great in the future as it had been in the past.

Mr. T. E. Franklin (Barry), in seconding the vote, said they all felt deeply grateful to the Company for what they did for the Institution. In fact, they had almost begun to regard Cardiff as their home.

The vote was carried with acclamation, and

Mr. Dovey, in response, said it was a source of the greatest possible pleasure to the Company to extend an invitation to the Institution to meet there, not only that day, but at any time, because they could see that the deliberations of the members were likely to be productive of much good. He was pleased to have Mr. Branson with them at the meeting; for he knew that he had enjoyed the full confidence and esteem of the late Chairman, whose activities were by no means limited to Cardiff. Anything his Company could do to further the interests of the gas industry, it was their bounden duty to do. "So," he concluded, "come as often as you like."

Membership Committee of the B.C.G.A.

A meeting of the Wales District Membership Committee of the British Commercial Gas Association was held at the close of the Institution business; and important proposals were discussed relative to work in the district.

Before separating, the members were the guests of the Chairman and Directors of the Cardiff Gas Company at tea, which was served in the offices.

A FEW NOTES ON GAS SALES.

This was the title of a paper prepared by Mr. W. C. Jackson (then of Merthyr Tydfil, now of Neath) for the meeting a year ago of the Wales and Monmouthshire District Institution of Gas Engineers and Managers. On that occasion, however, there was not time to read or discuss it; and so it was left over until the meeting of the Institution which was held in Cardiff last Thursday. The author was unfortunately unable to be present; and the paper [it will be found in the "JOURNAL" for June 9, 1914, p. 714] was read by the Hon. Secretary, Mr. Octavius Thomas, of Pentre. The following is a report of the discussion which afterwards took place.

The PRESIDENT (Mr. A. W. Branson, of West Hartlepool) said they were very much obliged to Mr. Jackson for his paper. The question of gas sales was an evergreen subject; and the members should have many useful hints to give. He would first call upon Mr. Mason to say something.

Mr. W. M. MASON (London) said he was very pleased indeed to find himself among the members again. Like the President, he had a feeling of regret when he came, because the last time—which was also the first time—he had the privilege of being in Cardiff, he had the pleasure of sitting beside the late Chairman of the Cardiff Gas Company at an enjoyable luncheon, and was very sorry to think that he was now dead. It seemed to him that he would have a difficulty in discussing the paper that had just been read to them without referring to the British Commercial Gas Association; and he did not know whether the meeting would allow him to do this. Mr. Jackson had put the case very well indeed; but it seemed rather strange that he should say almost in the opening sentence of the paper (which, of course, was written a year ago, under different conditions) that if he had known so many papers were being written on the same subject, he would have chosen another matter to deal with. Perhaps if he had had any idea of the events that were to take place at the present time, he would not have written on the subject at all. Yet it seemed to him (the speaker) that this was just the time—when every gas undertaking was in trouble in some way or another, some because they had too much work, and others because they had not enough, and everyone through the drop in residuals and the rise in price of coals—for the reading of such a paper. There was at this juncture no more fitting subject for discussion than this question of gas sales, because if ever gas sales needed to be pushed it was now. This was a point which needed to be strongly emphasized. He would like to read them an extract from a letter which was just being issued:

> Although at first sight the present may appear an unpropitious and unsuitable moment to ask boards and committees to increase their expenditure, it will, we believe, on full consideration, be realized that this time of acute national and industrial crisis is one that calls for increased rather than diminished efforts to maintain and to expand business, so as to increase the area over which to spread standing charges. With everyone for some years to come compelled to retrench in expenditure, it is of the utmost importance to the gas industry to bring home to the public that an increased judicious expenditure on gas is in many cases the best means to the desired end—that of true economy.

The board or the manager who sat down and mourned, and said: "War is on, so we can do nothing," was assuredly going to be left behind in the march of progress. It was the board or man who said: "Times are hard, and we need every penny we can get, but wise expenditure is necessary if business is to be sustained," who was going to prosper. The paper, he thought, rather suggested useful means to retain present custom than ways to get new business. Maintenance was, he believed, also lately necessary, with good service, to retain business; but if they wanted to get new business (and this was what the gas industry required to-day), they would have to do more than this. As an example of what he had in mind, he would refer to the question of coke sales. This was a matter which had reached a very acute stage not very long ago; and it had been overcome. How? By what the gas industry had done? No; by outside influences—the war particularly—which had raised the price of coal. The last time the coke business was in an unfavourable state—it was not so very long ago—a national strike of miners helped to relieve the situation. The coke branch of the gas industry had thus been cleared of trouble at least twice, not by what the gas industry had done, but by outside influences. And it seemed to him that many gas managers, instead of learning from these experiences to develop their local coke sales, simply went off to sleep again. He felt that many undertakings—large and small—all over the country, in spite of all the recent trouble with coke sales, would, the minute the situation was relieved, go back to their old ways, instead of trying to secure new avenues for business as they ought to do. Mr. Jackson referred to the poor demand for water-heaters. Why? Because they were not being advertised and pushed sufficiently. There were four lines on which new business could be secured in gas sales. The first was by the provision of adequate show-rooms. No gas company nowadays could afford to do without show-rooms. Secondly, there was the distribution of advertising literature. It might be from the B.C.G.A. or elsewhere, but it was absolutely necessary to have it to distribute. People in Cardiff, in London, or in other places were all the same. They were not going to buy things about which they knew nothing; but if they were persistently and consistently educated in the advantages of gas water-heaters, they would certainly use them. The third essential in successful salesmanship was personal canvassing. The author had referred to this point, and had employed a fitter. An experienced man was best; but if it was not possible to get one, an inexperiencd man could soon be trained. The fourth necessary method in developing sales was Press advertising. The B.C.G.A. had spent during the last three years something like £50,000 in advertising gas, because they were convinced—and the members of the Association, represented 80 per cent. of the gas industry—it was the right and wise thing to do. If the individual members of the Association wanted to get their share of the benefit of this expenditure they also needed to follow up the National work by local advertising. He believed each one of those present heartily approved of the work of the British Commercial Gas Association; but some of them could not get their directors or committees to see eye to eye with them. If they wanted their undertakings to progress they simply could not afford to remain outside the B.C.G.A. He believed it was absolutely essential to the real national life, progress, and prosperity of the gas industry.

The PRESIDENT remarked that Mr. Jackson pointed out that gas sales depended to a very large extent upon the views of the public towards gas generally, so that it needed no apology on Mr. Mason's part for speaking of the British Commercial Gas Association, for it was the object of the Association to cultivate the point of view of the public. The author did not go very far into the question of advertising; but no doubt a show-room would be included in the local seasonal advertising mentioned. For his own part, he distinctly felt that a show-room was a necessity for even the most moderate sized undertakings. His own experience of canvassing was that it should be systematic, and not haphazard. Records should be brought into the office of what were the results of a canvasser's calls; and then these records should be sorted out, on the card system, and dealt with as required. A lot of time was wasted in canvassing in a general way. The economical manner was to do it systematically, and precede it by a personal letter to the party to be called upon, advising him of the visit, and setting out what the canvasser was going to say. In this way, he was much more likely to get a reception that would lead to business. The author had alluded to maintenance charges; and it seemed to him (the speaker) that these should be brought down to cost price, whatever that might be. This cost price must, of course, vary in different districts; and therefore he did not see how they could arrive at a standard charge. One point in which he believed in connection with retaining business—which was the aspect of the matter that the paper applied more directly to—was in calling on consumers before removing any apparatus, and making a determined effort to remedy the cause of the order for the removal before carrying it out. Many people suddenly make up their minds to have a cooker or fire taken out for some trivial reason, which might easily be overcome; and by making an attempt to smooth out the little difficulty, lots of apparatus was saved from being taken out. So far as selling gas and hiring charges for apparatus were concerned, he thought in those districts where gas was unavoidably high priced the hiring rates should be cut-down to a rock-bottom figure, because if they put the slightest avoidable obstacle in the way of using gas, they would be making matters still worse. Even with high-priced gas, a lot could be done when apparatus was made easy to get and maintain. Mr. Jackson referred to uniform pressure, the lack of which, it appeared to him (the President) was the cause of more complaints than people often realized. He had a misgiving himself as to the use of pressure-raisers, as he found they often led to complaints. Perhaps he did not work the system in the right way; but the putting up and down of the pressure in the course of the lighting hours made some people grumble. Whether or not these complaints were sufficient to condemn the pressure-wave system, he could not say.

Mr. J. H. CANNING (Newport) said he would like to disclaim a certain amount of credit that the writer had attributed to him, but which was not really due to him. His (the speaker's) name had been mentioned in the paper as being the author of some articles on the gas-engine. He would like to point out that for these credit should be given to his father. He personally had nothing whatever to do with the matter. With reference to the question of charges for maintenance, the author had said it might possibly be good policy to reduce these charges to a minimum. Speaking for himself, he did not think consumers had any objection to paying a moderate charge for maintenance; and if anything was to be given, it was good policy, he thought, to give it in the way of a little extra attention, which consumers appreciated. If consumers did not get what they considered an adequate amount of attention, they were apt to drop maintenance, and, as a consequence, to drop gas altogether. Mr. Mason had criticized gas men somewhat on the question of coke sales; and it was rather a difficult matter to reply to him at all in an open discussion like the present. He would therefore simply content himself with pointing out to Mr. Mason that if coke sales and gas sales were pushed equally vigorously, much of the advertising work of the British Commercial Gas Association would be rendered nugatory.

Mr. A. E. DAVEY (Aberdare) congratulated Mr. Jackson on his paper, with the spirit of which he entirely agreed; and he said that, with the remarks of Mr. Mason in mind, he would like to point out how differently gas managers in colliery districts had to work in the matter of advertising from those in seaside or

residential towns. For instance, in the matter of cookers the scope was comparatively limited; and as to the sale of coke, the collier appeared to like his coal-fire so well, and obtained his coal so cheaply, that he kept the fire going day and night. Geysers, again, were almost a dead-letter in such a district. With regard to maintenance, in his town they had a system whereby a consumer had to pay a rent. The Company fitted-up an installation, and made a charge of 1s. per quarter for an ordinary installation without a cooker—where simply a boiling-burner or griller was fixed. This charge was made unless a consumer took 2000 cubic feet of gas per quarter. With a cooker, the charge made was 1s. 6d. per quarter, with the same minimum consumption. In some cases objections had been raised, and people had demurred to paying; but it had not retarded business to any appreciable extent. During the last three or four years, they had been putting on an average of about 250 to 300 consumers. With regard to a charge for maintenance, the charge they made was 5d. per burner per quarter; but in some cases where there were twenty or thirty burners, a specially reduced rate was fixed. This was in operation for some considerable time, and very successfully; and it was still working to-day. But, in addition to this plan, they gave an option to consumers to let a fitter attend to the burners, and charge them simply for the materials used. This, it seemed to him, appealed rather more to consumers than the fixed charge per burner. As he had said, colliery districts like his could not be compared with residential and seaside places in the matter of pushing sales; and if the author regarded his own town in the light of a colliery district, a great deal of explanation would be found of the differences of the way in which they had to work as compared with places of another character.

Mr. Thomas Canning (Newport) said he noticed that in the paper the author recognized the great value of high-pressure gas and high-pressure gas-lamps as a method of advertising. It was a powerful means of competition with electricity; and it seemed to him that the gas undertaking in a town like Merthyr would find it a great advantage to have a high-pressure system. It not only increased the appreciation in the minds of the public of the value and power of gas, but it added to the uses of gas for lighting; and there was certainly no town in which it had been introduced where it had not been the means of increasing greatly the lighting demand. As to pressure raising, this was of vital importance at the present time, during the hours of maximum demand. He had used it now for some years in this way: A pressure was found that would be suitable for the maximum hours; and in this pressure there was no variation at all, excepting during the short time of raising, which was done perfectly smoothly, without any inconvenience to anybody, and almost imperceptibly, and during the short time of lowering again, which was done in the same imperceptible way. During the time the supply was going on, it was quite constant. Therefore pressure raising had proved a method rather of maintaining uniformity of supply. He had been very pleased to hear Mr. Mason's remarks, with which, in the main, he was fully in accord. As to what he had said with regard to the question of coke, he agreed with him to the extent that perhaps they had not all done everything they might do in popularizing the use of coke; but he would like to remind Mr. Mason that all the residuals on a gas-works were produced under strictly, he was going to say anti-commercial, but at any rate non-commercial, conditions. What he meant to say was that they produced gas under commercial conditions, inasmuch as they made it as it was required. Look for a moment at the case of the brick-maker. If the building trade was down entirely, he would probably turn out his kilns altogether, or he would make only a sufficient number of bricks to anticipate the possible demands. A pipe-maker did the same; but the coke-maker in a gas-works could not do it. He had to go on making coke whether or not anybody wanted it. If he could not sell it, he had to pile it up in his yard, and go on piling it up. He could not say: "I have done with this. I have enough of this coke." Therefore it did not seem to him that the remarks of Mr. Mason were as applicable as they might appear to be.

Mr. W. B. Mimmack (Pembroke) said it had been suggested that Mr. Jackson's paper dealt rather with the subject of the retention of business than of the extension of it; but really he was not quite sure that there was all the distinction between the two which was endeavoured to be made. Great stress had been laid on the advantages of personal canvassing and advertising; but there was so much personal canvassing done in these days that those who did it were apt to be regarded as somewhat of a nuisance, and to be looked at somewhat askance. It was very difficult, unless a personal canvasser was unusually gifted, for him to make any serious impression upon the people with whom he came in contact. The very best advertisement a company could have was a satisfied and enthusiastic consumer; and if the business of maintenance was carried out in the way in which it should be, thoroughly and efficiently from the consumer's point of view, the undertaking secured canvassing and advertisements all over their district—and canvassing and advertisements of very much greater value, he was inclined to think, than could be obtained through the other mediums referred to. A large number of consumers would be found who moved in their own small coteries, and were very popular in their particular sphere; and if they could get to know these people, and satisfy them that the attention given was of the best, and the charges made of the smallest, they would do the undertaking more good than by ordinary canvassing.

Mr. J. E. Kenshole (Merthyr Tydfil) said that, Mr. Jackson not being present, and the paper having been written while he was at Merthyr, there were one or two observations on it which might be well for him to make. First with regard to the show-room and advertising and canvassing. He quite agreed with what Mr. Mason had said. A show-room was very necessary, and advertisements were necessary at their proper time; but he still thought that personal canvassing was essential. They kept a man a good portion of whose time was spent on this. He was a man well able to carry out any work that came along, and to advise consumers on any point. With regard to water-heaters, he had tried his best to get these out; but the district was not a favourable one, and during the two years that they had been working hard in this direction they had only managed to place a couple. A water-heater was for months kept in operation in the window of the show-room; and it was still there. As Mr. Davey had pointed out, colliery districts such as these were totally different from seaside and residential areas. The majority of the men were colliers, who got their coal at such a cheap rate that they never let their fires go out from one year's end to the other. With reference to maintenance charges, it was true that they charged 3d. per burner, and then brought it to 2d.; but they went further, and kept a distinct record of every single consumer and noted the cost. Then in cases where they found there was any profit made—that was to say, if they found at the end of the twelve months that it had not cost them so much as the consumer was charged—they allowed him the amount off the following year's rate. This plan worked very well indeed; and it made the consumers more saving. When they were charged a definite sum of 2d. per burner per month, they were not so careful as when they knew they would get something back if the actual cost did not amount to so much in the year. As to cookers, they kept a sufficient quantity, and never turned anybody away; but they endeavoured to offer cookers on the hire-purchase system on such advantageous terms that consumers would prefer them in this way rather than on simple hire. During the four or five years this plan had been in operation, they had put out a considerable number. The greatest trouble now was the large increase in price. They advertised cookers regularly on the gas bills, with the cash price and the cost on the three-years' hire-purchase system. This announcement had, however, appeared so long that people knew exactly the cost, and now the prices had gone up they said: "We will not have a cooker unless you can supply it to us at the same charge as before." At Merthyr they tried to keep the pressure as even as possible; and by putting it on gradually at the time of heavy consumption, and taking it off gradually, they did not feel it. He thought there might have been some misapprehension as to what the President had referred to.

The President said he alluded to the pressure-waves of automatic controllers for lighting and extinguishing the public lamps. He had felt this difficulty more perhaps than usual, owing to the extraordinary lighting at the present time. Many of the lamps were extinguished early, when people were still burning gas; and putting on the pressure and taking it off at various times during the evening had proved somewhat of a nuisance. He proposed a vote of thanks to the author for his paper.

Mr. H. D. Madden (Cardiff) seconded the vote of thanks to Mr. Jackson, which was heartily passed.

CHLORIDES AND CHLORINE IN ENGLISH COKE.

In the "Journal" for the 23rd of March last, a brief notice appeared of a paper read by Mr. S. W. Bridge, before the Society of Public Analysts, on the subject of the soluble chlorides and the total chlorine contained in English coke. The following are some additional particulars, taken from an abstract of the paper in the current "Journal of the Society of Chemical Industry."

Thirteen samples of gas coke contained from 0·013 to 0·262 per cent. of soluble chlorides and 0·039 to 0·499 per cent. of total chlorine (both as NaCl). A sample of metallurgical coke contained 0·007 per cent. of soluble chlorides and 0·071 per cent. of total chlorine; and a low-temperature cannel residue, 0·357 and 0·918 per cent. respectively. The variations of the chlorine in coke are thus very similar to those found in coal. The low ratio of soluble to total chlorine in the metallurgical coke indicated the larger amount of chlorine expelled on carbonizing the coal under coke-oven conditions. Samples of coal and cannel rich in chlorine were carbonized in a fire-clay crucible at about 400° to 500° C., and also in a platinum crucible for 15 hours over a Méker burner. The proportion of total chlorine expelled at the higher temperatures was much greater than at lower ones. For example, a cannel containing 0·987 per cent. of chlorine left a low-temperature residue with 0·918 per cent. and a high-temperature residue with 0·314 per cent. For the determination of soluble chlorides, from 15 to 30 grammes, crushed to pass a ten-mesh sieve, were boiled with water for an hour beneath a reflux condenser, the liquid filtered, and the filtrate and washings acidified with nitric acid, permanganate added till the liquid was pink, and the chlorine determined volumetrically. To obtain the total chlorine, from 2·5 to 5 grammes were ignited with 3 to 6 grammes of a mixture of sodium carbonate and lime (1 : 2) until the carbon was completely oxidized; the mass was boiled with water containing a little lead carbonate to remove sulphides, and the chlorine in the aqueous decoction determined as above. No material loss of chlorine occurred when burning-off the carbon.

THERMAL CONDUCTIVITY OF REFRACTORY MATERIALS.

The members of the Yorkshire Section of the Society of Chemical Industry had before them at a recent meeting a paper on the above-named subject, the combined production of Messrs. G. Dougill, H. J. Hodsman, and J. W. Cobb—the last-named being the Livesey Professor of Coal Gas and Fuel Industries at the Leeds University. The paper is contained in the number of the Society's "Journal" for the 15th inst., and the following are some extracts from it.

Introductory.

A refractory material must primarily resist high temperatures. But advance in the design of high-temperature furnaces necessitates, to an increasing degree, the consideration of qualities other than infusibility; and among these thermal conductivity is one of the most important. Refractory materials are used most commonly to bound a space in which a high-temperature operation is carried out; and the less heat they conduct the higher is the thermal economy attained. If, however, a little heat is sacrificed by using a material of considerable thermal conductivity, a lower infusibility in the material is permissible. The importance of conductivity attaches most obviously to processes in which heat has of necessity to be transferred through the refractory material, as through the wall of a gas-retort or a bye-product coke-oven. There the speed of working the carbonization process is limited by the conductivity of the material. Plainly, high conductivity may be advantageous or disadvantageous according to the special circumstances. The dominating necessity of infusibility has so far influenced practice that, in the great bulk of fire-clay refractories, conductivity has been little considered. The manufacture has been the same whether the material was for heat transmission or insulation; but now both manufacturers and users are inclined to give more consideration to the conductivity of their materials. The authors have been concerned with measuring this property, and particularly with a method which did not involve the preparation of special test-pieces but could be applied to ordinary bricks and blocks.

Conductivity.

If a plate of material be taken of uniform thickness d, and with parallel faces maintained at temperatures θ_2 and θ_1:

$$Q = \frac{ka(\theta_2 - \theta_1)t}{d} \qquad (1)$$

where Q is the quantity of heat transmitted in a time t; a is the area of the plate; k is a constant dependent on the material of the plate. Then k is termed the "thermal conductivity" of the material. In C.G.S. (centimetre-gramme-second) units it is the number of calories transmitted from one face of a cube of side 1 centimetre to the opposite face in one second when the two faces are maintained at temperatures differing by 1° C. However, k is a constant in a limited sense only; and it has long been known that the conductivity of a material might vary considerably with temperature. The experiments here recorded deal with the measurement of k and its variation with temperatures.

The most complete study of the conductivity of refractory materials hitherto made is due to Wologdine. In this research the relation of conductivity to temperature, to porosity, permeability, and temperature of firing was studied in the case of almost the whole range of materials found in practice. The results have been widely copied into technical literature and are in general use. Wologdine's experimental methods invite certain criticisms. The material studied was specially prepared in the form of a disc 5 centimetres thick, which formed the top of a gas-heated furnace. The temperature difference across this was arrived at by inserting thermocouples at varying depths; and, by extrapolation from the temperatures observed, those of the upper and lower faces were calculated. From special experiments, he deduced that the temperature fell regularly from one face to the other, though this does not accord with other experiments, which show that the conductivity varies with temperature. The heat transmitted by the disc was measured in a water-flow calorimeter placed on the top of the disc; the product of the mass of water and its rise in temperature in passing through the calorimeter giving this in ordinary units for a working area taken as equal to the area of contact of the calorimeter and test-piece. From these measurements, k was calculated in accordance with the preceding equation.

It is a serious initial objection to these experiments that they were not made on the refractory materials in the form in which they generally come into commerce—viz., bricks of ordinary shape and size. Again, it is incorrect to take the area of contact of the calorimeter with the test-piece as the effective area of transmission.

By definition, the faces of the slab are supposed to be maintained at uniform temperatures so that the heat flow shall be rectilinear and parallel. On placing a water calorimeter on the disc, the upper surface of the latter becomes locally cooled and the lines of flow of heat thereby distorted in accordance with the new temperature gradients set up. As a result, the area of contact of calorimeter and test-piece can no longer be regarded as the effective area of transmission, which will widen-out towards the lower face. In our own apparatus we believe that these objectionable features have been eliminated. Bricks of ordinary size and shape are employed as test-pieces. Parallel heat flow has been attained by jacketing the calorimeter with a second calorimeter at the same temperature—on the well-known "guard-ring" principle. The water-flow calorimeter has been rejected on account of complications of manipulation, in favour of one in which temperature is constant, and the amount of water evaporated at 100° C. forms a measure of the heat transmitted.

Simultaneously and independently, the work of Wologdine has been criticized and the subject investigated by Heyn, Bauer, Wetzel, and Goerens. Heyn, Bauer, and Wetzel include a theoretical examination of the transmission of heat through solids and a valuable survey of the various methods of experiment which have hitherto been used. For various reasons they reject all these. In the case of the calorimetric method already referred to, they give as reasons the uncertainty of the effective area of transmission, though we believe that the difficulty is eliminated by the use of the "guard-ring" principle just mentioned. They prefer a method based on measurements of the temperature gradients in a brick heated at one end in a special apparatus. The deduction of the conductivity from these observations, though perhaps theoretically sound, is a process of considerable complexity; and the results obtained would suggest that it is scarcely justifiable. Thus, they find that the conductivity of a magnesia brick is less than that of a common fire-clay brick. The magnesia brick employed, judging from the chemical and physical data furnished, is one of a normal type, which, it is a matter of common experience, conducts heat very much better than fire-clay brick. The same applies to their results for a graphite brick. Contrary to our experience, they find that the conductivity of magnesia increases slightly with temperature.

Goerens, on the other hand, retains the calorimetric method, but seeks to obtain parallel heat-flow through the brick by means of the "guard-ring" principle. Both calorimeter and jacket are of the flow type as used by Wologdine. The temperature slope through the specimen was measured by a series of couples, while the heating was effected by an electrical hot-plate. Normal bricks of commerce were tested. Goerens' results agree substantially with ours, though they appear to be generally slightly lower; and he finds with us a decrease in conductivity of magnesia with the rise of temperature.

Clement and Egy have employed an entirely different method in some measurements on fire-clay material. This was prepared in the form of a hollow cylinder, along the axis of which heat was developed electrically, and hence the quantity of heat generated per unit of length could be calculated. Thermo-junctions, placed in the cylinder at different distances from the centre, enabled the temperature gradient along a radius to be arrived at, and thence, by calculation, the thermal conductivity of the material. The results obtained were slightly lower than ours. The chief practical objection to the method seems to be the necessity of constructing special test-pieces for the measurement. In this and other methods there has also to be considered the probable disturbance of the flow of heat resulting from the insertion of a number of thermo-couples into the test-piece.

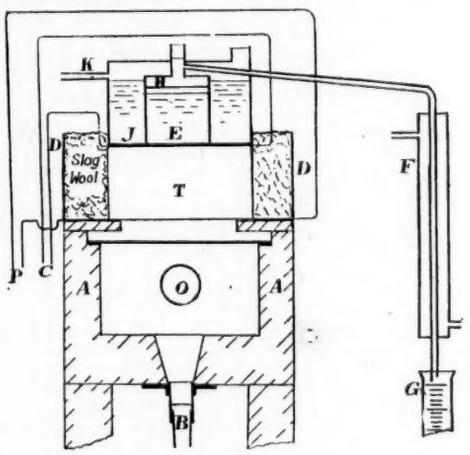


Fig. 1.

The apparatus employed in our experiments is shown in fig. 1. It consisted of a gas-heated furnace built up in two sections. The lower section A was a rectangular body of fire-clay, incased in sheet iron and stayed together with tie-rods. It was heated by means of a large rectangular (15 by 95 mm.) Méker gas-burner B, operated by compressed air, and introduced into the base of the furnace. A round hole O in each end of the furnace permitted the escape of products of combustion. The top of this furnace body was closed by a thin sheet-iron plate P ($\frac{1}{8}$ inch) in the experiments at the lower temperatures. This had a double advantage, in separating the flame from the thermocouples used in temperature measurement, and also in helping to keep uniform the temperature on the lower face of the test brick. Of course this plate did not last long, on account of oxidation; and in the higher-temperature experiments, when optical methods of temperature measurement employed, it was omitted altogether.

The upper section of the furnace contained the test-brick T.

This was carried by pieces of fire-brick ½ inch thick, which rested on the lower section, and all chinks were sealed by means of fire-clay and thin fire-brick pieces. Then a sheet-iron casing D, of the same size as the lower casing, was placed in position round the brick, and all the space intervening between it and the brick (3 to 4 inches) was filled with slag wool, or, for the high-temperature experiments kieselguhr. An advantage of this design of top section was its small heat capacity combined with high thermal resistance, which shortened materially the time necessary to get the apparatus into thermal equilibrium during an experiment.

The temperature fall across the brick was measured usually by two thermocouples; and this required considerable care. After repeated trial, a satisfactory method was found. It was necessary to isolate the lower couple from any possible contact with flame gases. To this end it was enclosed in a thin-walled silica tube of small bore (1·5 mm.), which was cemented into a groove cut in the lower face of the brick. A cement of composition adjusted to the temperature attained was employed—usually a mixture of magnesia, sodium silicate, and fire-clay slip. The depth of the groove was such that the couple was flush with the surface of the brick. The silica tube projected sideways on each side of the brick; and to allow for this a slot was cut in the outer iron case of the upper section. A platinum platinum-rhodium couple was used.

When the temperature of the lower face exceeded 900° C., it was taken with a Holborn-Kurlbaum optical pyrometer sighted on the middle of the lower face through one of the round flue-holes of the furnace—the iron plate being discarded. Comparison of the temperatures thus determined with those deduced by means of the thermo-couple showed agreement to 10° C. over the range 900° to 1400° C. The determination with the optical pyrometer was much the more convenient method when possible, and had the advantage of really measuring surface temperatures. The inside of the furnace was doubtless for our purpose quite a close approximation to an optically black body. The temperature of the upper face of the brick was measured by means of a couple C, of silver and constantan, lying in a groove cut so that the couple was flush with the surface. Good contact with the brick and care in the placing of the couple were essential. To attain this, a groove of such a size that the couple had to be lightly tapped in was cut by means of a hack saw. The groove being of the correct depth, the couple was so fixed in the proper position. This was a detail of great importance, particularly in the study of high-conductivity bricks; for only by care in the determination of the temperatures, and more particularly that of the upper face, could adequately concordant results be obtained. The cold junctions of the couples were maintained at constant temperature by immersion in a vessel through which cold water flowed. Some special experiments were made to confirm the reliability of this mode of measuring the temperatures of the faces.

On the top of the brick was placed the calorimeter, which was of sheet copper of No. 20 gauge, 9 inches long, 4½ inches wide, 3 inches high; the bottom being made as flat as possible. In it there was fixed an inner chamber E, 4 inches long, 2 inches wide, 2½ inches high, which formed the calorimeter proper on which the measurements were made. The volume of water distilled from the inner chamber was taken as a measure of the quantity of heat transmitted by a central portion of the brick 4 in. by 2 in. in section. The whole calorimeter was covered by a loosely fitting lid, through which projected a tube whereby fresh water could be added to the inner chamber when desired. During an experiment this was closed by a rubber stopper. Steam distilling from the inner vessel passed by a sloping tube running through the outer vessel to a metal condenser F at the side. The condensed water was collected in a measuring cylinder G. The bridge H, fixed across the inner vessel near the top, was intended to prevent "priming." It was found to be quite effective unless the boiling was exceedingly violent. The outer chamber J was furnished with an overflow tube K, to maintain the level therein constant during the preliminary heating; the requisite hot water being fed in through an opening made in the lid. During the experiment proper, the feed to the outer chamber was cut off and the water therein boiled away, just like that of the inner chamber, except that it was not collected. It served to form a hot water and steam jacket to the true inner calorimeter. It proved advantageous to surround the inner chamber with a non-conducting jacket, for which purpose sheet rubber was found very satisfactory.

To carry out an experiment, the apparatus was set up in accordance with the description given. The burner was lit, and the temperature of the lower face brought quickly to that required, and kept there for about one hour before readings were taken. During this period the water in the inner chamber was not allowed to distil over. Instead, a reflux condenser was attached to the inner vessel, and the steam condensed and returned to the calorimeter. The metal condenser at the side was meanwhile plugged. The waste water from the reflux condenser was used to maintain a constant level in the outer compartment of the calorimeter.

When it was desired to make experiments, the reflux condenser was removed, and the opening to the inner chamber tightly closed with a rubber stopper. The steam passed over, and was condensed at the side and collected in a measuring cylinder, usually for an interval of 5 to 10 minutes. From the volume of water collected per minute, the temperature difference, the distance across the brick, and the dimensions of the base of the inner chamber of the calorimeter, the average coefficient of conductivity was calculated for the range of temperature in question, assuming the validity of the equation already given. Thus, supposing that 22·6 c.c. of water are collected in five minutes in testing a brick 1½ inches thick, when the temperatures of its lower and upper faces are 1200° and 485° C. respectively, and the area of the base of the inner vessel is 8 square inches, or 51·6 square centimetres. We are then measuring the transmission of heat by a portion of the brick 51·6 square centimetres in area and 3·81 centimetres thick. The mean coefficient of conductivity for the temperature range is then:

$$k = \frac{Qd}{a\,(\theta_2 - \theta_1)\,t} = \frac{22\,6 \times 536 \times 3{\cdot}81}{51{\cdot}6 \times (1290 - 485) \times 5 \times 60} = 0{\cdot}0037$$

A number of results obtained with common refractory materials are included below. The fire-clay bricks were of an ordinary commercial brand. The "soft-fired" specimens referred to were made from the same batch as the "hard fired," but had not

TABLE I.

Specimen.	Chemical Analysis.	Thickness.	Apparent Sp. Gr.	True Sp. Gr.	P_a.	P_b.	Temperature Range of Measurement. Lower Surface.	Temperature Range of Measurement. Upper Surface.	Mean k.	Remarks.
		Inches.			Per Cent.	Per Cent.	Deg.	Deg.		
Fire-clay brick (Farnley)	SiO_2 66·0 Al_2O_3 31·0 Fe_2O_3 1·2 CaO 0·3 MgO 0·9 Alk. 1·0	1½	1·95	2·54	23·3	30·3	825	260	0·0029	Hard-fired to Seger cone 10—11 approximately.
							970	300	0·0029	
							1080	330	0·0036	
							1440	550	0·0040	
		1½					1100	420	0·0033	Another specimen.
							1350	510	0·0039	
Fire-clay brick (Farnley)	as above	1½	1·90	2·67	28·7	40·4	1005		0·00165	Soft-fired to Seger cone 8—9 approximately.
							1020		0·00120	
Silicious brick (Farnley)	SiO_2 82·5 Al_2O_3 16·1 Fe_2O_3 1·2 CaO & MgO Tr. Alk. 1·3	3	1·82	2·53	28·2	39·3	1300	310	0·0025	With many silica grains.
Silica brick (Gregory)	SiO_2 95·3 Al_2O_3 2·0	2½	1·75	2·32	24·6	32·5	1240	440	0·0039	
	FeO_3 1·1 CaO 1·5	2½	1·74	2·32	24·8		995	295	0·0030	Another specimen.
							1210	370	0·0035	Both coarse-grained.
							1395	440	0·0042	
Magnesia brick (Mabor)	SiO_2 5·0 Al_2O_3 0·4 Fe_2O_3 1·6 CaO 1·7 MgO. 92·1	2½	2·40	3·51	31·4	45·9	380	270	0·0170	Finer grained than the above.
							560	325	0·0151	
							600	400	0·0148	
							700	450	0·0132	
							750	470	0·0116	
							875	525	0·0110	
							1025	580	0·0101	
							1040	590	0·0098	
							1370	690	0·0091	

The chemical analysis and porosity data were not derived from measurements on the actual test brick, but on similar specimens of the same make. They will correspond approximately with those of the test bricks.

been kilned at such a high temperature. The tests were made on bricks 1½ inches thick, because the temperature range across the brick was smaller than in the case of 3-inch and 2½-inch bricks; and therefore the variation of conductivity with temperature could be more closely followed. The same applies to the experiments with the magnesia bricks, which were of a commercial brand.

The chemical and physical data in Table I. will serve to characterize the specimens. In this table the apparent specific gravity is the ratio of the mass of the brick to the total volume—*i.e.*, including pores; and the true specific gravity is the ratio of the mass to the volume occupied by the solid matter of the brick, excluding pores. The method of determination would take no account of closed pores. The corresponding porosities are also given. P_a is the ratio of the volume of the pores to the total volume of the brick, and P_b the ratio of the volume of the pores to the volume of the solid portion of the brick.

The experimental values obtained by the method described in this paper are for mean conductivities—*i.e.*, they are calculated on the supposition that the conductivity remains constant over the temperature interval in question, and the values have no precise meaning apart from the temperature limits. It was, however, desirable to know how the conductivity actually varies with temperature, so that the true conductivity at a given temperature could be ascertained from our results.

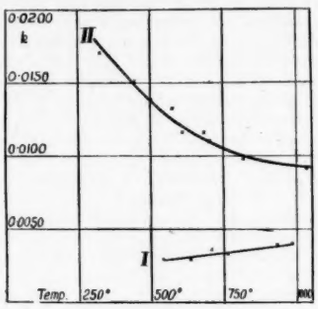


Fig. 2.

The curves given in fig. 2 show how the conductivities of the magnesia (II.) and fire-clay (I.) bricks studied vary with temperatures. The curve for silica does not differ much from No. 1 over the range studied. Each cross represents the experimental values of the average conductivity over a range of temperature, the mean point of which is shown in the abscissa. If this range of temperature be not excessive so that the conductivity may be taken as fairly constant over it, these values will approximate to the true conductivities at the temperatures given. The equation connecting the true conductivity with temperature for the magnesia brick is:

$$_\theta = 0{\cdot}0285 - 0{\cdot}379 \times 10^{-4}\,\theta + 0{\cdot}179 \times 10^{-7}\theta^2$$

This approximates closely to the Curve II. in the figure. The variation in the case of the fire-clay brick may be taken at linear, and similarly:

$$k\theta = 0{\cdot}00155 + 0{\cdot}25 \times 10^{-5}\theta$$

The curves show in striking contrast the influence of temperature on the conductivities of magnesia and fire-clay. It is therefore difficult to account for the fall in the conductivity of magnesia at higher temperatures, though from our experiments there seems to be no doubt about it. Goerens found a similar fall in his experiments made on a magnesia brick richer in iron oxide than the one we used, and probably denser. Even at the high temperatures, however, the conductivity of magnesia bricks is much greater than that of fire-clay.

The variations of conductivity with temperature in the case of silica and silicious bricks are of particular interest in view of the growing importance of these refractories; but the data accumulated are as yet insufficient to allow definite conclusions. Some typical values are given for these materials and, as will be seen, they do not differ considerably from those of fire-clay, though silica appears to have the slightly higher conductivity. The low value for the "soft-fired" brick calls attention to the desirability of high-temperature kilning whenever rapid heat transmission is important.

Porosity.

It is well known that the transmission of heat by refractory materials is impaired by porosity; and heat-insulating materials are frequently rendered porous intentionally. It has been suggested recently by Dr. J. W. Mellor* that the heat-insulating properties of pores will vanish at high temperatures, on account of the increase in importance of the radiation of heat across them, with rise of temperature, as compared with the conduction of heat through the solid material. This is doubtless true in part, because the rate of transmission of heat by radiation across a pore is, by Stefan's law, proportional to the difference in the fourth power of the temperatures; whereas the conductivity in the solid depends on simple temperature differences. Dr. Mellor, apparently overlooking the influence of the size of the pores and intervening solid grains, calculated that the rate of radiation across a pore would equal the rate of conduction through the solid at a red heat. The size—and also shape—of the solid grains and pores is, however, very important, because it determines largely the rate of conduction through the solid, but does not affect the rate of radiation across pores.

Taking this into consideration for pores of the size usual in refractory materials, it may be calculated that only at temperatures of several thousands of degrees does radiation become of the same importance as conduction. Thus, supposing we compare the transmission of heat across a parallel-faced slab of solid material, 0·01 centimetre thick, by conduction and the transmission by radiation across a similarly shaped air space, when the two parallel faces are in each case at $T_1°$ and $T_2°$ absolute, the quantity of heat transmitted by conduction across the solid per square centimetre per second equals $100k\ (T_2 - T_1)$ calories, and by radiation across the pore:

$1{\cdot}26 \times 10^{-12}\ (T_2^4 - T_1^4)$ calories, where $1{\cdot}26 \times 10^{-12}$ is the constant of the Stefan-Boltzmann equation. When the transmission of heat by radiation has become equal to that by conduction, we can equate these, giving:

$$100k\ (T_2 - T_1) = 1{\cdot}26 \times 10^{-12}\ (T_2^4 - T_1^4).$$

It is easy to calculate, from this equation, at what order of temperature the transmission of heat across a pore by radiation would become equal to that through a solid grain of the same size (say, 0·01 centimetre) by conduction, bearing in mind that $T_2 - T_1$ would be very small compared with either T_2 or T_1.

The average pore diameter in a refractory material is, of course, much less than 0·01 centimetre; so that only at temperatures far above the melting-points of refractory materials does the heat-insulating effect of pores vanish, and porosity increases the heat-insulating effect at all temperatures in use. Moreover, the smaller the size of the pores in the direction of heat transmission, the greater is the heat-insulating effect for the same actual pore space.

The size of the space has an important influence, and if it were of the order of 1 centimetre in thickness, Dr. Mellor's conclusion would be sound, and with T_2 and T_1 differing by 100° C. at a red heat, the transmission by radiation would become of the same order of magnitude as that by conduction across the solid.

While this does not apply, as has been shown, to the ordinary pores of a brick, yet it has considerable practical importance in other directions. It shows the limitations of the effectiveness of air spaces as heat insulators in furnace construction. It is clear that at a red heat the radiation of heat across an air space would render it ineffective as a heat insulator, and that it would be better to fill the air space with solid material—for preference highly porous. Convection in the air space would also lower its insulating efficiency.

Another interesting corollary to these considerations is that if radiation across pores is negligible at all ordinarily attainable temperatures, it cannot operate to cause the rise of thermal conductivity with the temperature occurring in most refractory materials. The abnormality of magnesia confirms this; suggesting that the variation in conductivity is dependent upon the nature of the solid material.

Diffusivity.

In all the measurements recorded in this paper, the temperature conditions in the test brick have been steady. This answers to the definition of conductivity, and is essential to the deduction of k by this method. But until such thermal equilibrium has been reached, the influence of heat conducted across the brick in causing a rise of temperature is not determined by the conductivity solely, but also by the heat capacity per unit volume of the material. The greater the latter the smaller the temperature rise produced. In such cases—*i.e.*, in all heating-up operations—it is the "diffusivity" or "thermometric conductivity" with which we are concerned. This is the quotient of the thermal conductivity by the heat capacity per unit volume, or $k \div c\,s$, where c is the specific heat and s the specific gravity of the material. The "diffusivity" in the C.G.S. units measures the rise in temperature produced in cubic centimetre of the substance by 1 calorie flowing in one second through 1 square centimetre of a layer 1 centimetre thick having a temperature difference of 1° C. between its faces.

To compare the diffusivities of the materials used in these experiments, it will be necessary to measure their specific heats, for the available data are very meagre. Heyn and Bauer give some specific heat measurements made on their materials, which will doubtless be approximately true for ours, and serve to give an idea of relative diffusivities. They are reproduced in Table II.

Table II.

Material of Brick.	Thermal Conductivity.	Temperature.	Specific Gravity.	Specific Heat.	Temperature Diffusivity.
		Degs. C.			
Fire-clay . . .	0·0028	500	1·95	0·23	0·0062
	0·0040	1000		0·26	0·0079
Silica	0·0024	500	1·74	0·26	0·0053
	0·0046	1000		0·27	0·0098
Magnesia . . .	0·0141	500	2·40	0·26	0·0226
	0·0085	1000		0·28	0·0126

The results we have obtained for silica and fire-clay material

* See "Journal," Vol. CXXV., p. 647.

do not disclose any appreciable difference in conductivity for lower temperatures, but at higher temperatures the thermal conductivity of silica seems to be rather greater. The difference in conductivity is emphasized if the fire-clay material is soft-fired, which induces low conductivity. This is of some note. Gas-retort material, for example, when a retort is made in one piece, is often soft-fired to maintain straightness of line in burning, though in high temperature carbonization the harder firing may be effected in use, and the defect remedied. Built-up retorts have an advantage in this connection, as hard-fired bricks can be used. The temperature diffusivity of silica appears to be, at high temperatures, appreciably greater than that of fire-clay materials; and in intermittent heating operations, including many carbonizing processes, the changes of temperature on the refractory may be so considerable as to make this property of more importance than the thermal conductivity alone. It would seem desirable to investigate the point more closely. The high thermal capacity of magnesia moderates its diffusivity, but still leaves it markedly superior to the other materials.

RECENT PROGRESS IN PYROMETRY.

This was the subject of a paper read by Mr. CHARLES R. DARLING, Lecturer in Physics at the City and Guilds Technical College, Finsbury, at a recent meeting of the Royal Society of Arts. It may be remembered that in the autumn of 1910 Mr. Darling delivered four Cantor Lectures before the Society on the subject of "Industrial Pyrometry," which contained an account of the appliances in use at that time. [The lectures were noticed in the "JOURNAL."] During the intervening period many improvements have been introduced, and new instruments designed; and it was the object of the paper to give an account of the chief advances made in pyrometry since his previous communication to the Society. The paper, which is fully illustrated, will be found, with a report of the discussion upon it, in the "Journal" of the Society for the 14th inst.

In his introductory remarks, Mr. Darling says it is interesting to note, in view of the recognition of the value of scientific research forced upon us by the war, that, apart from the work of Government institutions—such as the National Physical Laboratory and the United States Bureau of Standards—practically all recent progress in pyrometry has been due to the efforts of instrument makers, and little of importance has emanated from our educational institutions. At the present time, Mr. Darling says, most of our physicists are absorbed in atomic and molecular physics, to the exclusion of the industrial applications of their science. Hence it has been left to manufacturers of pyrometers, chiefly in Britain and America, to furnish the improvements in methods, and to extend to the industries the applications of high-temperature measurements. He considers that the work accomplished in this direction deserves much wider scientific recognition than it has received; and it is to be hoped that in the future any funds ear-marked for research will be spent largely on investigations definitely directed to the improvement of industries. It is satisfactory to be able to state that, as the result of scientific methods, British makers of pyrometers are not merely independent of other countries, but, in the author's opinion, stand unrivalled in regard to the quality and accuracy of the instruments which they supply. During the period covered by the paper no pyrometers based upon new principles have been introduced; and the advances made therefore relate to methods previously in use.

STANDARDS OF TEMPERATURE.

Referring to standards of temperature, Mr. Darling says various investigations of fixed points have resulted in the confirmation, or, at most, slight modification, of previously accepted figures; and he gives a table showing the values now generally recognized for purposes of standardization, in terms of temperatures on the gas scale (omitting fractions). Up to the highest reading at present obtainable directly on this scale (1550° C.), these standards appear now to be well established. The melting-point of platinum, though arrived at by extrapolation, is probably correct to two or three degrees, and forms a very useful standard for the calibration of high-reading pyrometers. All the fixed points refer to pure materials, and considerable errors may arise in graduating instruments unless the substances used are of a high grade of purity. Commercial materials are frequently unsuitable. Antimony, for instance, may vary by 10° or more in melting-point from that of the pure metal. To overcome this difficulty, the United States Bureau of Standards now issues materials of certified fixed points, so that any user of pyrometers may check or recalibrate his instruments with accuracy. Mr. Darling thinks this procedure might, with advantage, be followed by the National Physical Laboratory, which is the centre of accurate pyrometer standardization in this country.

THERMO-ELECTRIC PYROMETERS.

The author deals first with thermo-electric pyrometers, and states that much attention has been given by the various makers to the details of indicators, which in almost every case have been improved in the direction of reliability. A new departure in the method of indicating temperatures in commercial instruments has been made by the Leeds and Northrup Company of Philadelphia, who have adopted the potentiometer principle, previously only employed for accurate laboratory work. Another adaptation of the potentiometer principle to indicators was introduced by the Cambridge Scientific Instrument Company, with the view of obtaining closer readings over a given range. If an indicator is graduated from 0° to 1000°, and the working range is 500° to 1000°, the useful part only occupies one-half of the scale, and accuracy of reading is thereby restricted. If, however, it can be arranged that the pointer shall remain in the zero position until the pyrometer has reached 500°, the whole scale may be used for the interval between 500° and 1000°; thus enabling finer readings to be taken. A similar result is attained by a different method in the instruments made by Mr. R. W. Paul, in which the indicator takes the position of the galvanometer in a Wheatstone bridge—the pyrometer being in the indicator circuit. By adjusting the resistances in the arms of the bridge, a small current from the external battery may be caused to pass through the indicator so as to oppose that due to the pyrometer. This opposing current may be regulated so that the pointer of the indicator remains at zero until the pyrometer has attained 500°; thus leaving the whole scale available for graduation from 500° upwards.

RESISTANCE PYROMETERS.

With regard to resistance pyrometers, Mr. Darling says there are few changes to record; the patterns in use five years ago having undergone little modification. Platinum, which is the metal invariably used, has been shown recently by Sir William Crookes to be measurably volatile above 1000° C., and this explains fully why the readings of these pyrometers went astray when a continuous temperature above this figure prevailed in the furnace. For work at low temperatures, such as occur in connection with cold storage, and also for use in chemical operations at moderately high temperatures, the resistance pyrometer is to be preferred on account of its greater accuracy; and its use for such purposes is extending rapidly. The author directs attention to the interesting researches of Mr. Northrup, as recorded in the "Journal of the Franklin Institute" early last year, which, he says, give promise of an extension of the resistance method to a range of temperature beyond the present limit of 1000° C. He found that certain metals, such as copper, increase steadily in electrical resistance up to the melting-point; and that in the process of melting the resistance is doubled in value. Mr. Darling thinks it may be possible to devise an instrument in which the temperature is deduced from the resistance of a molten metal. If so, the range of resistance pyrometers could be extended to at least 1400° C., and even higher if a protecting sheath capable of withstanding a greater temperature could be found.

RADIATION PYROMETERS.

The drawbacks incidental to the use of thermo-electric pyrometers for temperatures exceeding 1000° C. have led to a wide adoption of the radiation method in processes involving readings above this point. The Féry pyrometer, made by the Cambridge Scientific Instrument Company, is extensively used, and has been improved in details. In the early form, a suspended-coil galvanometer was necessary as indicator, owing to the low electromotive force developed by the junction on which the rays were focused. The use of an alloy of antimony and zinc, in atomic proportions, as one of the junction materials, has enabled pivoted indicators to be used, owing to the greatly increased electromotive force obtained, which is a great advantage from the standpoint of portability. The gilt mirror formerly used has been superseded by one of a special alloy of higher reflecting power, and the focusing head graduated so that, without sighting, the pyrometer may be focused for any desired distance. Whipple has applied this pyrometer to the determination of the temperature of molten metals by mounting it at the open end of a fire-clay tube, the closed end of which is dipped into the metal, and kept permanently in focus. By this means readings as high as 1500° C. have been taken in small ladles; but so far it has not been found possible to apply the method to large masses which cannot be approached closely. Foster's fixed-focus instrument has also proved to be quite satisfactory for general workshop requirements, and has found many applications.

OPTICAL PYROMETERS.

The standard forms of optical pyrometers due to Féry, Wanner, and Holborn and Kurlbaum are now well established, and have been improved in detail for greater convenience of reading in the workshop. A new type of instrument has come into use, based upon the principle of colour extinction. By interposing a solution of correct colour and density between the eye and the heated source, all luminous rays may be extinguished. The instrument consists of an eye-shade, in which prepared cells, corresponding to known temperatures, may be fitted. Double vision is used, being better suited to prolonged observation.* To control a furnace so as to attain a desired temperature, observation is made through the appropriate pair of cells from time to time, until a faint red image is seen, when the heat supply is regulated so as to maintain a constant temperature. A second pair of cells in the eye-shade correspond to a temperature a few degrees higher than that required; and on looking through these the field should appear dark. In this manner a very close approximation is obtained, and the apparatus finds a useful application in the hardening of steel and other processes which involve the production of a steady temperature. A form of this pyrometer has been issued consisting of a single cell, in which the

* An illustrated description of the instrument referred to was given in the "JOURNAL" for Nov. 26, 1912, p. 666.—ED. J.G.L.

thickness of the layer of liquid may be adjusted, and graduated in temperatures corresponding to the thickness.

A second form of colour-extinction pyrometer has been introduced by Messrs. Alder and Cochrane. It consists of a small telescope, the rays through which are intercepted by a coloured prism, that may be moved up and down so as to interpose any desired thickness in the path of the rays. In using the pyrometer, the heated object is focused in the telescope, and the prism moved until a completely dark field is obtained. A temperature reading is then indicated opposite a fixed pointer on a scale which moves with the prism. Using this instrument on a filament lamp, Mr. Darling found a good agreement in the readings obtained by different observers; and, being simple in construction and small in size, it is thought that this pyrometer should prove very useful to foremen and others in charge of furnaces.

A promise of a new form of optical pyrometer is conveyed in a paper read by Messrs. Paterson and Dudding before the Physical Society in March last. They showed that the temperature of many metallic substances could be measured accurately by matching the colour against that of a black body until equality was obtained; the temperature of the black body being varied until the colours, viewed in the field of a Lummer-Brodhun photometer, were identical. Filament lamps, with an ammeter and rheostat in circuit, were brought to colour equality at various current strengths with the standard black body, the temperature of which was assigned to the filament at each adjustment. The lamps thus became secondary standards—a given current corresponding to a given temperature. Using a carbon filament lamp thus standardized, and adjusting it to colour equality with platinum at its melting-point, the temperature indicated was 1750° C.—a very close approximation to the accepted figure. Mr. Darling thinks it may reasonably be expected that our instrument makers will produce an optical pyrometer on these lines, suited to industrial purposes

Recorders.

The advantages of continuous records of furnace temperatures have been widely recognized during the last few years; and consequently developments in this branch of pyrometry have been extensive. The modern form of the Roberts-Austen photographic recorder, made by the White Instrument Company, is used in many places; but the present tendency is in favour of inked records, which are always visible, and do not require photographic treatment. Mr. Darling gives a brief description of the newest forms of recorders. The utility of the thread recorder, made by the Cambridge Scientific Instrument Company, has already been extended by adapting it for the purpose of obtaining several simultaneous records. An illustration was given in the paper of one having side by side two indicators, the pointers of which are depressed at intervals on to an inked thread, which touches the chart and makes a mark. A double chart is mounted on a single drum, which rotates by clockwork, and a separate pyrometer may be coupled to each indicator. When four records are required simultaneously, two threads, wetted with inks of different colours, are used; and by an automatic arrangement the pointer may be made to descend on each thread in turn. Two pyrometers are connected to each galvanometer, and are brought into circuit in turn, so that the records of each appear in a different colour; and thus four records in all can be secured on the same chart. It may be used for either thermo-electric or radiation pyrometers. The Leeds and Northrup Company of Philadelphia have introduced a recorder which is actuated by an electric motor instead of clockwork, and which may be used for resistance or thermo-electric instruments. This recorder is much used in the United States, but has not yet been adopted in Britain. Messrs. Siemens, who were the first to introduce an ink recorder, have recently effected several improvements in their instrument. The case is now made entirely of metal, jointed so as to be dust-proof. Robust construction and small size are features of it.

In bringing his paper to a close, Mr. Darling said he thought it would be seen, from what he had brought forward, that a substantial advance has been made in the production of instruments for measuring and recording high temperatures since the subject was previously before the Society. At the present time, when everybody is in search of methods of adding permanently to our industries, the example furnished by the manufacture of pyrometers may be cited as a useful guide to success in this direction. All the establishments in which these are made in this country are under the direction of thoroughly skilled scientific men, who are constantly devising new instruments with a view to greater efficiency and a wider field of application. All are in close touch with the National Physical Laboratory, which has proved invaluable to them in regulating the calibration of their instruments, and securing a uniformity which is now comparable to that which exists in thermometers. The result is a thriving and constantly extending industry, not threatened by foreign competition, and not in need of artificial props to ensure its success.

Apparatus in illustration of the paper was exhibited by the Cambridge Scientific Instrument Company, Mr. R. W. Paul, the Foster Instrument Company, Messrs. F. E. Becker and Co., Messrs. Cochrane and Co., and Messrs. Townson and Mercer. Referring to them, Mr. Darling pointed out that they were all of British manufacture, and he said they could not be surpassed, or probably equalled, by any other country. They were examples of what might be accomplished by the intelligent application of science to industry.

DAMAGE TO THE RHEIMS GAS-WORKS.

The number of the "Journal des Usines à Gaz" just to hand contains a few particulars of the damage done to the gas-works at Rheims during the recent bombardments.

In the course of the successive bombardments, eighteen shells fell upon the gas-works. Two gasholders were pierced, an incendiary bomb fell upon the coke column, a shell destroyed the exhauster-house, and damaged the station meter of 706,000 cubic feet capacity. A bomb dropped from an aeroplane wrecked the governor-house. Other projectiles struck different buildings, particularly the dwelling-house on the works, which was hit by two of them. Gas making had to cease towards the end of August. The distributing plant was greatly damaged, but to what extent it is scarcely possible to say at present.

When the projectiles fell upon the gasholders, they made holes in the crowns through which gas escaped and became ignited. Each holder, however, continued to descend until it was nearly down; and then the position of things would have been dangerous had not the precaution been taken, the moment the gas-flame decreased in size, to plug the perforation, so as to avoid the entrance of air. What was noticed at Rheims in regard to the falling of projectiles upon gasholders bore out the various theories put forward from the outset of hostilities—viz., that when a holder runs freely upon its guide-framing, and can descend in such a way that the gas is always under pressure at the perforation made in the crown, emptying is effected without any inconvenience until the vessel has grounded, provided precautions are taken to stop the passage of gas at the exact moment when, the intensity of the flame having diminished, this operation can be most easily performed.

GAS FROM WOOD WASTE AND PEAT.

In the "Journal" for the 30th of March (p. 789), reference was made to a letter by Mr. E. Smith, in the Engineering Supplement to "The Times," on the subject of making gas from wood waste. In the last issue of the supplement Mr. Smith gives some particulars as to the cost of plant, working expenses, and the value of bye-products.

The approximate prices of complete plants for quantities ranging from 25 to 500 tons of wood waste per week are from £4000 up to £40,000; and the weekly working expenses are: For 25 tons, 20s.; 50 tons, 26s.; 100 tons, 23s.; 500 tons, 20s. He puts the approximate yield per ton at 50s.; and the annual net profit on the above-named quantities, at £575, £1600, £4150, and £29,500. The products of distillation per ton of wood are given as follows: Boiled tar, 15 gallons, at 7d. per gallon; wood oils, 4 gallons, at 10d. per gallon; charcoal, 6 cwt., at 40s. per ton; wood naphtha, 5 gallons, at 2s. 9d. per gallon; and acetate of lime, 1¼ cwt., at 9s. 6d. per cwt. Mr. Smith points out that he has allowed a good value for the wood waste—viz.: 10s. per ton. If the wood has no value, and this amount is deducted, it will increase the approximate above-named annual net profit to £637, £1725, £4400, and £30,000 respectively.

Mr. Smith concludes his letter with some remarks on the profitable use of peat—a fuel which can in many instances be purchased at a price as low as £1 per acre. He says it is not profitable to employ peat as fuel for direct firing; but if it be used in a suitable high efficiency gas-producer, the gas so obtained, having a calorific value as high as 190 B.Th.U., can be used for gas firing steam-boilers economically. Gas of 190 B.Th.U. is not suitable for gas-engines of high power; consequently there is no occasion, except for heating purposes, to produce a gas higher than 145 B.Th.U. Even with this lower value it is practically possible, with peat of 40 per cent. moisture, to generate gas and obtain an evaporation of more than 5 lbs. of steam from and at 212° Fahr. per pound of peat fuel fed into the gas-generator. In many industrial centres it should be possible to obtain air-dried peat of 40 per cent. moisture delivered into the power-house at about 5s. per ton. These results, which Mr. Smith says can be demonstrated at any time, compare most favourably with the ordinary practice of about 9 lbs. of steam from and at 212° Fahr. per pound of coal now costing at least 26s. per ton. Good coal at about 9s. per ton delivered would be equal to peat at 5s. per ton. The writer is of opinion that the distillation of peat, now that it can be dried down to 25 per cent. moisture, is most profitable; the results being somewhat similar to those outlined for waste wood. Peat coke or charcoal has a good market waiting. It would pay even to discard the distillation and make it in gas-fired kilns. Under favourable conditions, it could be turned out at about £1 per ton with a comparatively small initial outlay.

The Society of Engineers' Meeting.—Mr. F. W. Goodenough writes to point out an error by the reporter of his remarks at the recent meeting of the Society of Engineers—*ante*, p. 402. At the foot of the second column of this page, the last few lines should have read: "He believed the physiological explanation of the dislike people had to what the author had called 'apparatus heating,' which produced just the same effect as the high-temperature convection currents, was that if the temperature of the air of the room was raised unduly, its capacity for retaining moisture was increased," &c.

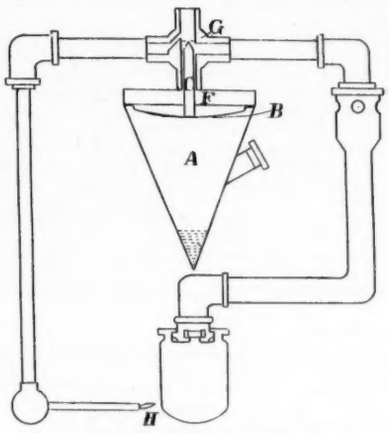
REGISTER OF PATENTS.

Gas Flash-Signs.

CROUCH, R. J., of East Ham, Essex.

No. 8465; April 3, 1914.

To secure the automatic intermittent lighting and extinguishing of gas-burners (for advertising flash signs) the patentee proposes to employ a flexible cap or diaphragm arranged to expand or alter its normal shape with a springing or snapping action from its one position of rest to another position in which it is temporarily held by the pressure or heat derived directly or indirecty from gas-burners, such expansion or alteration of the cap operating a valve to cut off the supply to the burners.



Crouch's Gas-Flash Sign-Worker.

The diaphragm B above the container A has only one position of rest, and is so arranged as to open the gas-way to the burner. It is so formed that the valve C carried by it has no intermediate position—turning the gas "full-on" or "right-off" instantly. The container holds a small quantity of liquid capable of being vaporized under the heat of the burner. It is sealed up after the air has been partially exhausted, so that a partial vacuum is created upon cooling. Upon the water vaporizing, pressure is exerted under the flexible cap, which springs outwards and resumes its normal position with a snapping action, upon the pressure being reduced, "by reason of its formation, and is also aided by atmospheric pressure."

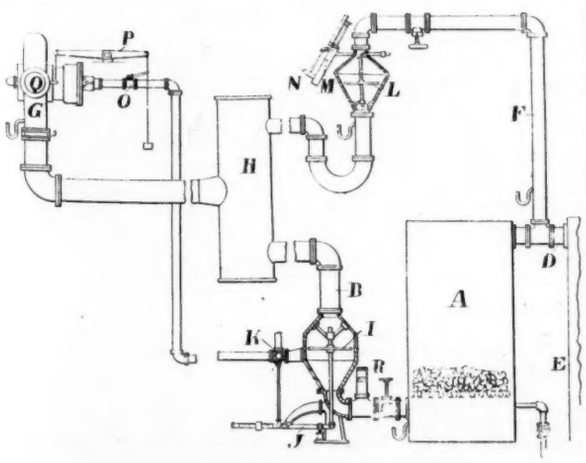
The box F acts as a seal to prevent leakage of gas into the atmosphere when the valve C is in the open position as shown. The gas-way G supplies the permanent pilot-light H.

Governing Mechanism for Water-Gas Plant.

BRITISH THOMSON-HOUSTON COMPANY, of Cannon Street, E.C.; a communication from the General Electric Company, of Schenectady, U.S.A.

No. 12,573; May 21, 1914.

This invention, relating to automatic governing mechanism in its application to water-gas producing systems, has for its object to provide a system wherein the supply of both primary and secondary air is automatically regulated, so as to furnish the proper amounts and at the correct pressures; also to provide a novel form of variable volume governor.



Governing Mechanism for Water-Gas Plant.

A diagrammatic view is given of a water-gas plant embodying the improved automatic governing mechanism.

The generator A contains a grate supporting a bed of fuel as usual. Primary air is supplied under the grate by a pipe B, which has a stop valve C. The products of partial combustion (carbon monoxide, carbon dioxide, and nitrogen compounds) are led off through a pipe D to the carburettor E. Between the generator and the carburettor a pipe F joins the pipe D, for supplying the secondary air. The air is supplied to both pipes by a centrifugal air compressor G driven by a steam-turbine. From the discharge outlet of the compressor air is delivered to the two branch pipes B and F, preferably by the interposition of a header H. In the branch pipe B is placed the "primary constant volume governor." This consists of a disc I, floating on the column of air, located in a section of the air-pipe which is preferably enlarged and made of frusto-conical form.

The velocity of the air produces a pressure on the disc which is counterbalanced by a weight on a graduated lever J pivoted to the stem of the disc. With the weight set at the position marked for any given volume, the disc will be in equilibrium only when this volume is passing. A rod attached to the lever operates a throttle valve K in a main supplying steam to the turbine. When the disc moves the lever, the throttle-valve will open until the air compressor is supplying a sufficient volume of air to hold the disc steady in a given position against the action of the weight. As soon as this condition is reached, equilibrium will be maintained, and a constant volume of air will flow into the generator. A dash-pot is connected to the lever, to damp its oscillations.

The secondary-air governor involves the use of a throttle-valve which will automatically maintain such a pressure beyond it as will force a desired volume through whatever restrictions may exist. The pressure preceding will, of course, be greater; but it may be of any value above that to be maintained beyond the governor. The pressure of the primary air is somewhat higher than that of the secondary air; so that the secondary governor serves to throttle the secondary air supply down to a given quantity. The governor comprises a disc L mounted in a section of the air-pipe F—enlarged and preferably of frusto-conical form. The stem is connected to a butterfly valve in the pipe connected to the base of the frusto-conical section. On the spindle of the valve, and outside the pipe, is a beam carrying a counter-weight M. As the quantity of air tends to increase so as to raise the disc, the butterfly valve is partially closed, to decrease the pressure in the pipe beyond, and so decrease the flow.

In the operation of a water-gas plant, it is necessary to gradually increase the volume of the secondary air from the beginning to the end of the blowing process. In order to accomplish this automatically, the weight M is arranged to move so as to act at a constantly increasing radial distance from the spindle of the valve; and to this end it moves in an inclined guide (carried by the end of beam) made in the form of a dash-pot filled with oil—the weight acting as the plunger. To regulate the motion of the weight a bye-pass connects the two ends of the dash-pot in order to permit the plunger to displace oil or other liquid in it, and a regulating valve N controls the flow of liquid through the bye-pass.

When the desired temperatures are reached in the generator and carburettor, and it is desired to stop blowing and make gas, the valves in the primary and secondary air pipes are closed, and at the same time a quick-acting valve O is closed, shutting off nearly all the steam to the turbine—letting only enough pass to keep the machine running. The lever P, to which the valve is connected, also operates to close a butterfly valve Q in the inlet of the air-compressor. The stoppage of the air supply permits the constant-volume governor in the primary-air pipe B to pull the throttle valve K wide open; and a relief valve R in the primary-air pipe relieves it of excess pressure due to any cause.

When the gas-making period has ended, and it is desired to blow again, the necessary adjustments of valves to stop the production of gas are made; the valves in the primary and secondary air pipes are opened; the weight M on the secondary air governor is reset, so that it can begin its downward and outward sliding movement; and the valve O and the butterfly valve Q opened. A full head of steam is thus admitted to the turbine, which accelerates very rapidly and starts the air supply. The primary-air governor responds quickly and throttles down the steam to the amount that is required to deliver the predetermined volume.

The blowing period and the gas-making period cover definite intervals of time—usually from six to eight minutes; and the manipulation of the valves, &c., to change from one period to the other and back again are performed either manually by the operator or through suitable automatic devices as desired.

Gas-Heated Annealing Furnaces.

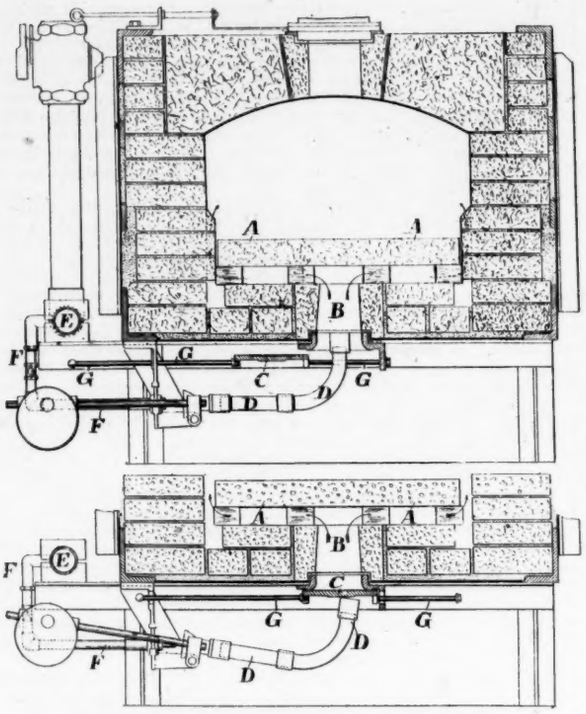
BRAYSHAW, S. N., & E. R., of Hulme, Manchester.

No. 10,630; April 30, 1914.

This invention relates to annealing furnaces with swivelling gas-burners which can be withdrawn from the openings in the furnace bottom, with dampers to close the openings when the burners are withdrawn.

The illustration (p. 460) shows a sectional elevation of the furnace with one burner in operative position, and a transverse sectional elevation of the lower part of the furnace with the damper closed and held up against its seat by the burner.

Over each burner opening B, the slab or hearth A is mounted to diffuse the flame from the burner—the heated products travelling to the sides of the furnace before rising up, thus thoroughly heating the bottom and sides. Below the hearth slabs is formed a longitudinal channel at each side of the furnace, to collect any slag, thereby preventing the collection of scale or dirt in such a way as to impede the passage of the flame. The burner openings in the bottom of the furnace are of such a size that secondary air is drawn in around the burner mouth, and each is fitted with a sliding damper C, by which it may be closed. A swivelling burner D (fitted below) projects into each opening. The burner can be moved downwards out of its operative position to allow of the damper being closed. It will, when raised again, hold the damper against its seating. A gas supply pipe E is placed longitudinally externally along one or both sides of the furnace, with branch pipes F to supply the burners. Each branch pipe is rigidly fixed at one end to the pipe E, and at the other end is fitted with a nozzle or jet to direct the gas into the burner. Each burner is mounted to swivel



Brayshaw's Gas-Heated Annealing Furnace.

in a vertical direction without moving the nozzle from its position at the mouth of the burner; and there is a counterbalance weight W by which the burner is held to its normal working position. The face of the burner opening B and of the damper are preferably milled or tooled to ensure a close joint; and the damper is loosely supported on rods passing through slots in the brackets, to allow of it being raised against its seating by the burner. When the burner is withdrawn, the damper is moved by the rod or handle G, and when the burner is released again it bears against the underside of the damper, raising the latter into place against the face of the burner opening to close it.

Gas-Heated Crucible Furnaces.

Ionides, A. C., of Porchester Terrace, W.

No. 15,778; July 1, 1914.

This invention relates to crucible furnaces heated by the combustion of a self-burning gaseous mixture "containing the constituents in as nearly as possible the proportions necessary for complete combustion without either the addition of air or a substantial residue of either constituent"—the combustion being effected above atmospheric pressure in a chamber surrounded by a flue which conveys the resulting products of combustion downwards to be thereafter emitted into the atmosphere at a point below the level of the furnace, as described in patent No. 2839 of 1912. The object of the invention is "to apply to such a furnace the principle of preheating the supply of air, fuel, or both . . . by means of the products of combustion therefrom in such a manner as to obtain an increased efficiency."

A sectional central elevation of a furnace is given; also sectional plans on the lines X and Y. The crucible is placed within a combustion chamber A to which a pipe conveys a combustible mixture usually of coal gas and air maintained in as nearly as possible the proportions necessary for complete combustion without the addition of further air or any substantial quantity of either constituent remaining over after combustion. For this purpose regulating apparatus of the type described in patent No. 21,112 of 1911 is suggested. Combustion takes place at a pressure slightly above the atmospheric pressure, and the products of combustion pass upwards from the combustion chamber, through an opening B, into a space above, then downwards between the interior and outer walls, both of which are made of refractory material. In passing downwards the products of combustion are utilized to preheat one or both constituents of the combustible mixture, and "thus be thoroughly cooled before leaving the furnace." In the case illustrated, both constituents of the mixture are preheated. The air is admitted to a duct C, arranged spirally in the space between the walls and terminating in a chamber D, containing a valve, operable from outside the furnace, to control the passage of air into a pipe E leading to the mixture supply pipe A.

The passage intervening between adjacent spirals of the duct C forms the flue down which the products of combustion now pass to an outlet pipe F which carries the products of combustion into the atmosphere at a point below the level of the furnace. The length of the air-duct C is chosen to give the desired cooling of the products before they leave the furnace.

The coal gas forming the other constituent of the combustible mixture is admitted at G to a pipe arranged in the spiral flue and terminating in an annular chamber H surrounding the air-pipe E. Perforations (increasing in number per unit length of this pipe in the direction of air flow) place the chamber in communication with the pipe wherein admixture of the coal gas with the air takes place, whereupon the mixture passes onwards to the combustion chamber through the supply pipe A. A valve, formed by closing the pipe A in a casing and providing an aperture at such a position as to shut-off or establish communication between the pipes A and E, enables the supply of mixture to the combustion chamber to be controlled from outside the furnace; and, in the case of the pipe A, being made of metal (so that it is desirable to withdraw the latter after the supply of mixture to the furnace has been cut off), it is only secured in position by a sleeve movable into engagement with a pin in the fixed casing, as in a bayonet joint.

Distilling Tar, Pitch, and Other Viscous Substances.

Crossley, K. I., and Brighten, H. W., of Manchester.

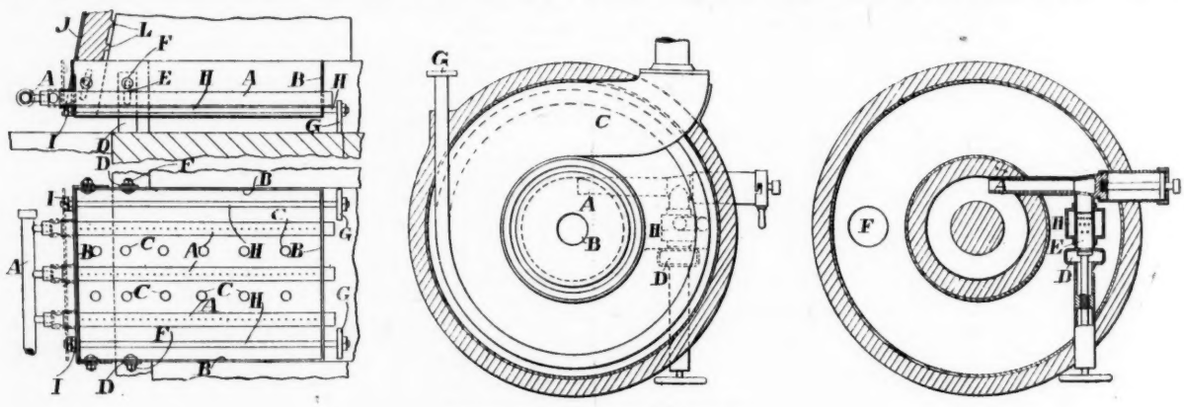
No. 19,392; Sept. 3, 1914.

This invention relates particularly to that class of apparatus in which advantage is taken of the well-known natural law that when a hot fluid is caused to issue from a restricted passage the resulting rapid expansion causes an acceleration of evaporation with a corresponding fall in temperature of the fluid as it expands.

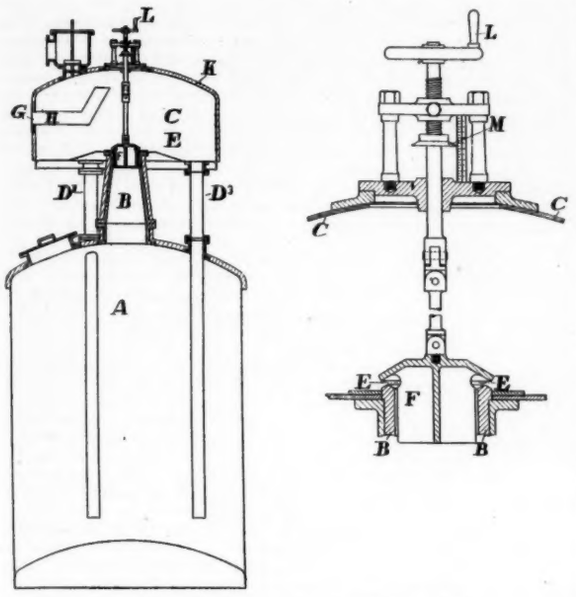
A diagrammatic sectional elevation of the apparatus is given on p. 461; also a similar view (on a larger scale) of the valve controlling the restricted passage and the means for adjusting and setting it.

The still or distillation chamber A (set in a brickwork furnace or otherwise heated in any convenient manner) communicates, by the neck B, through the restricted area or passage E controlled by the adjustable valve F, with the expansion chamber C. The valve (adjustable by the hand-wheel L) is set in accordance with the indications of the pointer M on a graduated scale prior to the distillation, in order to give a more or less restricted passage E to suit the nature of the substance under treatment. When set, the valve is locked in position by the tightening of a nut, and is not again moved until a different substance is undergoing distillation. Each return pipe D^1 D^2, &c. (any number, from one upwards, may be employed), passes downward from the bottom of the chamber C into the liquid under treatment to within a short distance of the bottom of the still, and is thus sealed below the level of the liquid therein. The outlet G, for the products of distillation, is connected to a condenser in the storage sump or tank for the tar or like liquid; and the outlet pipe H, which projects internally into the chamber C, terminates in an up-turned end, in order to prevent froth being blown with the products into the outlet.

On heating up the contents of the still, the froth would rise through the neck B, pass through the passage E under the adjustable (but now locked and stationary) valve F, into the chamber C. The froth, on passing through E, is broken up, with resulting free expansion and rapid liberation of vapour and simultaneous condensation or coalescence of the froth. The vapours pass away from the chamber through the pipe H and outlet G, while the liquid condensed from the froth passes back by the pipes D^1 D^2 to the bottom of the still. As this returned liquid is slightly cooler, and therefore denser, than the substance in the bottom of the still, convection currents are set up which tend to accelerate the circulation. This process is continued until



Ionides' Gas-Heated Crucible Furnace.



Crossley and Brighten's Tar-Distillation Still.

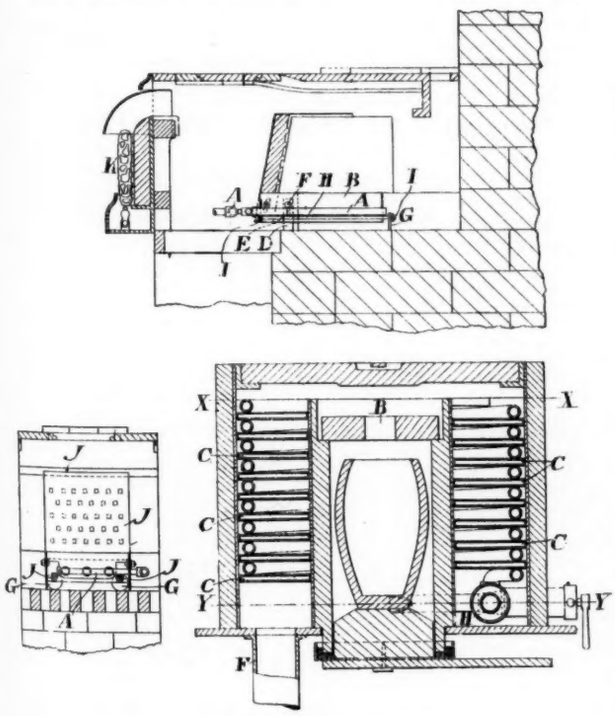
a point is reached when frothing ceases, after which distillation or evaporation is carried on in the usual manner—care being taken that the level of the liquid under treatment is maintained at a height above the lower end of the return pipes throughout the whole operation.

Gas-Heated Kitchen Ranges.

VALENTINE, H. S., of Glasgow.

No. 16,959; July 17, 1914.

According to this invention the device for heating the boiler essentially consists of a gas-burner adapted to be placed below or against the boiler, and when in position is adjustable relative to the boiler. The burner has fitted in connection with it a deflector for the hot gases



Valentine's Gas-Heated Boiler.

round the boiler—the burner and deflector constituting a removable water-heating fitment. As the use of such a fitment would prevent the employment of coal in the range for heating the room, the patentee prefers to fit to the front of the range, in conjunction with the heating device, a gas-fire "of any suitable or well-known type." The supply of gas to the water-heating fitment and to the gas-fire may be controlled separately or jointly, as desired.

The arrangement referred to is shown in a vertical cross section of part of a kitchen range, a sectional front view of same, and sectional and plan views (to an enlarged scale).

The water-heating fitment consists of a burner A, in a tray or casing B, preferably closed on all four sides and open at the top, while a number of perforations C are formed in the bottom and sides, for the admission of secondary air to the burner. At the front of the tray, one on each side, are feet or supports D, and the tray is provided with a slot E and an adjusting locking device F. By moving the tray up or down in the slots, the tray and burner can be adjusted to the height of the boiler flue and secured in the adjusted position by the locking device. The rear end of the tray may be adjusted by a disc G eccentrically fitted on a rod H passing through (or under, or at the sides of) the tray to the front, and having a lock nut I fitted on it. When the tray is inserted in the boiler flue the adjustment of the rear is made by rotating the disc G until the tray is raised to the desired position, when the discs are retained in the adjusted position by the locking device I.

In order to deflect the hot gases from the burner round the boiler, a deflector is provided which may be formed integral with, or adjustably fitted to, the end of the tray near the front of the grate, so as to form a passage for the escape of the hot gases from the burner to the usual flue of the range. This deflector, which extends some distance over the top of the boiler, consists of a metal casing into which is fitted a fire-brick having projections at its inner surface so arranged as to constitute passages for conducting the hot gases over the exterior of the boiler before they pass to the top and escape to the usual flue. When the water-heating fitment is in use in the fire-place of a kitchen range, its presence prevents the employment in the range of coal for heating the place. So the patentee proposes to fit to the front of the range a gas-fire (shown at K) practically flush with the front of the range and secured in place in any suitable manner.

Gas Metal-Heating Furnaces.

HALL, I., of Aston, Birmingham.

No. 3036; March 23, 1915. Redated Feb. 24, 1915.

This invention, which is one of a long series of patents, has for its object to provide a furnace with more especial reference to improvements in the heating parts by means of atmospheric burners using gas at approximately ordinary town gas pressure.

According to the present invention, a plurality of atmospheric burners are preferably symmetrically arranged, and provided with tops as in patent No. 5888 of 1914. The gas is supplied to these burners from a chamber; the various burners or units being connected to this chamber, which is of comparatively very large capacity and to which the gas is fed preferably through a thermostatic regulator as described in patents Nos. 21,072 of 1912, 26,583 of 1913, 28,346 of 1913, 5198 of 1914, and 6016 of 1914.

It is similar to the furnace shown in patent No. 7238 of 1914, which was given in the "JOURNAL" last week, p. 408.

APPLICATIONS FOR LETTERS PATENT.

6998-9-7000.—MORGAN, P. B., "Gas-producers." May 10.

7075.—COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATÉRIEL D'USINES À GAZ. "Coin-operated meters." May 11.

Gas Lighting in Westminster.

Following the receipt of a letter from the Kensington Borough Council—intimating that they are not in a position to continue their arrangement with the Westminster City Council to undertake the lighting, cleaning, &c., of four electric arc lamps in Brompton Road owned by the City Council, owing to the fact that they (the Borough Council) no longer use arc lamps and do not stock the necessary carbons—the City Council have decided on the substitution of gas lighting for the lamps in question.

Market Deeping Gas Company.—A dividend of 4 per cent. was declared at the recent annual meeting of the Company, held under the chairmanship of Dr. Benson.

Audley Gas Undertaking.—The Accountant and Gas Secretary of the Audley District Council (Mr. Arthur Dean) has submitted the gas revenue account for the year ended the 31st of March. The sale of gas produced £2277, and of residuals £634; the total income being £2942. The manufacture of gas cost £1988 (of which £1321 was for coal); distribution, £510; and capital and other expenditure made up a total of £2883, leaving a net profit of £59.

Price of Gas at Bradford.—A 5d. increase in the price of gas is in store for Bradford consumers. In the annual financial statement, it was mentioned that a substantial increase would be necessary to bring the Gas Department, which has suffered heavily by reason of the circumstances arising out of the war, into line with the other municipal trading undertakings, which have recovered sufficiently to make a profit and contribute to the relief of the rates. The Gas Committee decided last Friday to recommend the City Council to fix the price of gas at 2s. 6d. per 1000 cubic feet, instead of 2s. 1d.

Gas Profits at Bingley.—One of the principal items of business at the last meeting of the Bingley Urban District Council was the passing of the accounts of the Gas Department for the year ended the 31st of March last. The Chairman of the Gas Committee (Mr. Whitwham) said the sale of 134,831,000 cubic feet of gas had yielded a revenue of £12,427, compared with a sale of 130,958,100 cubic feet and a revenue of £12,076 in the previous year. There was a net profit of £598, against a loss of £193 before; and the balance of profit had been added to the reserve fund, which now stood at £2505. In concluding his statement, Mr. Whitwham announced that, in consequence of the Committee having been able to place their contracts for coal before prices had reached the existing high rate, it would not be necessary to alter the charge for gas (1s. 10d. per 1000 cubic feet).

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress had been made with Bills down to the rising of the House for the Whitsuntide recess last Wednesday :—

Bill brought from the Commons, read the first time, and referred to the Examiners: Lurgan District Council.

Bills reported: Ashington District Council, Bury and District Joint Water Board.

Bills read the third time and passed: Ashington District Council, Doncaster Corporation, Prescot Gas, Wolverhampton Corporation Water.

Bills Royal Assented: Ascot District Gas and Electricity, Ilfracombe Gas, Statutory Companies Redeemable Stock, 1915

HOUSE OF COMMONS.

The following further progress had been made with Bills down to the rising of the House for the Whitsuntide recess last Wednesday :—

Bills brought from the Lords, read the first time, and referred to the Examiners: Ashington District Council, Prescot Gas, Wolverhampton Corporation Water.

Lords Bills read a second time and committed: Altrincham Gas [Lords], Gas and Water Provisional Order Bills (Nos 2 and 3), Northwich Gas [Lords], Sutton Water [Lords].

Bills reported: Brighton and Hove Gas [Lords], Frimley and Farnborough District Water [Lords], Ormskirk Gas and Electricity [Lords], Warwick Gas [Lords], Weardale and Consett Water—all with amendments, except the Frimley and Farnborough District Water.

Bills read the third time and passed: Ilfracombe Gas [Lords], Lurgan District Council.

A Bill to confirm a Provisional Order under the Private Legislation Procedure (Scotland) Act, 1899, relating to Forfar Gas was presented last Tuesday, and considered the following day.

The Cheshire County Council have petitioned against the Gas and Water Provisional Orders (No. 2) Bill, in respect of the Hoylake and West Kirby Order.

Supply of Refreshments at the Birkenhead Gas-Works.

In answer to the question of which Mr. W. Thorne had given notice [*ante*, p. 413], Mr. H. T. Baker, Financial Secretary to the Army Council, stated on Monday last week that the officer commanding the battalion in question had reported that no arrangements were made by him or by the officer in charge of the working party to supply the men with liquor. Beer of a light kind had been ordered by the Manager of the gas-works for his own men still working in the neighbourhood; and he extended the issue to the soldiers. The officer in charge, on becoming aware of this, restricted the issue to an allowance of one pint per man per shift of eight hours.

GAS AND WATER PROVISIONAL ORDERS CONFIRMATION BILL (No. 1).

This Bill was down for consideration by the Unopposed Bills Committee of the House of Commons last Wednesday. Mr. Whitley (the Chairman) said the measure contained a number of departures from precedent, and he would have to investigate them. The consideration of the Bill was therefore postponed.

BRIGHTON AND HOVE GAS BILL.

The Unopposed Bills Committee of the House of Commons last Wednesday sent this Bill forward for third reading. It has already passed the House of Lords [see "JOURNAL," April 27, p. 216].

Mr. SEAGER BERRY (Messrs. Sherwood and Co., Parliamentary Agents) said the main object of the Bill was to extend the limits of supply to include two new parishes. There was nothing else of importance in it. He called attention, however, to clause 10, which gives power to the Directors to subscribe to funds raised in national emergency which would get over any difficulty as regards subscribing to funds such as were now being raised for various purposes in connection with the war. Clause 11 provides for granting pensions or gratuities to employees disabled during the war, or to the dependants of employees killed in action. There were 220 of the Company's employees with the forces. In connection with this matter, a discussion had taken place with the Brighton Corporation, and it had been agreed that the expenditure on such pensions or gratuities should not exceed ½d. per 1000 cubic feet of gas supplied by the Company in any year.

Clause 7, dealing with the appointment of a managing director or managing directors, either for a fixed term or without any limitation as to time, has been withdrawn by agreement with the Brighton Corporation.

WARWICK GAS BILL.

The Unopposed Bills Committee of the House of Commons last Wednesday sent this Bill (promoted by the Warwick Gas Company) forward for third reading.

Mr. LEES (Messrs. Lees and Co., Parliamentary Agents) said the Warwick Gas Company were incorporated in 1822, and had not been to Parliament since. The authorized capital was £15,000; and the Company were empowered to supply gas within five miles of the town of Warwick. The Company were, of course, free from any restrictions as to the quality of the gas they supplied, and as to the price charged. Similarly there was no limit to the dividends, as the Gas-Works Clauses Act was not passed until 25 years later. The undertaking, however, had been carried on with a view to the benefit of the consumers. Gas had been supplied at a cheap rate; and, instead of dividing all their profits as dividends, the Company had spent large sums out of revenue on capital account. The amount so spent amounted to £28,000. It was now proposed, however, to put the Company under the terms of the Gas-Works Clauses Act, and to restrict them as to dividend, price, and calorific power. At the same time, it was proposed to convert the £15,000 capital into stock on the basis of the average dividends paid during the past ten years—viz., 14 per cent. This would give a total of £42,000, and in the ordinary course the Company could have added as 5 per cent. stock the £28,000 spent on capital out of revenue. This it was not proposed to do, however. When originally deposited, the Bill proposed to make the capital £56,000; but as the result of negotiations with the Warwick Corporation, this amount had been reduced to £50,000. This was arrived at on the basis of adding the amount of money spent on capital out of revenue during the past ten years and the working capital provided out of profits. The actual total was then £51,810; but they agreed to call it £50,000. Thus a sum of £17,000 spent on capital out of revenue went to the good of the undertaking. Independent structural valuations of the undertaking had been made by Messrs. Corbet Woodall and Son and the Company's Manager; and they both agreed that, as it stood to day, the value of the land and plant was £45,000. The maximum price of gas asked in the Bill was 4s. Until recently the actual price had been 3s.; but in the present emergency this had been increased to 3s. 3d. There was a differential of 1s. per 1000 cubic feet outside Warwick. The Bill also asked for £30,000 of additional capital, and one-third borrowing powers. This sum, it was calculated, would carry them on for 14 years.

Mr. MOON, K.C. (the Speaker's Counsel), pointed out that the Company had only spent £11,000 during the last ten years.

Mr. LEES said the reason for this was that they could not get the money, and the result had been that the Company had not been able to push the business. Of the 2900 houses in Warwick 900 were not supplied with gas.

The Bill has already passed the House of Lords.

ORMSKIRK GAS AND ELECTRICITY BILL.

The Unopposed Bills Committee of the House of Commons last Wednesday sent this Bill forward for third reading. It has already passed the House of Lords [see "JOURNAL," April 27, p. 216].

FRIMLEY AND FARNBOROUGH WATER BILL.

This Bill, which has already passed the House of Lords [see "JOURNAL," April 27, p. 216], was sent forward for third reading by the Unopposed Bills Committee of the House of Commons last Wednesday.

WEARDALE AND CONSETT WATER BILL.

The consideration of this Bill was commenced by a Committee of the House of Commons, presided over by Sir WILLIAM DAVIES, some weeks ago. The fact, however, that the Committee only sat three days per week accounted for the length of the proceedings.

The Bill is promoted by the Weardale and Consett Water Company—an amalgamation of two separate Companies—who now have powers to supply water in a large area in the County of Durham, including the City. The scheme of the Bill is to construct a new reservoir at Burnhope, and to allow water to be taken from certain adjacent springs until the reservoir is completed. It is also proposed to increase the charges in order to meet the capital expenditure incurred. The scheme involves an aqueduct 28 miles long; and the yield from the new source of supply is estimated at 4,440,000 gallons per day—bringing the Company's total available daily supply to 11,100,000 gallons.

The opposition consisted mainly of the local authorities, who protested against the increase of rates, and several asked for purchase clauses. This latter request, however, was abandoned early in the proceedings, which resolved themselves into opposition against the proposed increased charges and some form of compulsion upon the Company to carry out the works proposed in the Bill. The promoters offered a clause by which the full new charges should not come into force until a certificate was obtained from the Board of Trade to the effect that £100,000 had been spent upon the purposes of the Act. This, however, did not meet with approval, on the ground that the Company could easily spend this sum on the aqueduct and be no nearer the completion of the reservoir, which was regarded as the essential thing. It was asked that the Company be put under compulsion to construct the pipe line in five years, and the reservoir in ten years—a total of 15 years in all. The object of the proposed increase in charges was to have a uniform rate of 10 per cent. throughout the area. At present there are varying rates, but less than 10 per cent.; and the effect of the proposed change would be a greater rate of increase in some portions of the area than in others.

On Friday week, the Committee passed the preamble of the Bill with some modifications in points of detail. As to the increased charges, the 10 per cent. is to apply to property with a rate able value of over £10; and in the case of houses with a lower rateable value, the minimum charge is to be 12s., instead of 13s. as proposed in the Bill. The Company's offer to spend £100,000 upon the new works before the full new charges could come into operation was increased to £200,000—*i.e.*, until this amount is spent there is to be a reduction of 5 per cent. off the charges to be made for water. Water by meter is to be charged at 1s. 6d. per 1000 gallons, instead of 2s. as in the Bill.

LEGAL INTELLIGENCE.

ACTION OVER A GAS-PLANT WARRANTY.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

(*Before Mr. Justice* ATKIN.)

Cory Brothers and Co., Limited, v. Mather and Platt, Limited.

In this case (which was again before the Court last week), Messrs. Cory Brothers and Co., Limited, of Cardiff and Swansea, sued Messrs. Mather and Platt, Limited, manufacturing engineers, of Manchester, for damages for alleged breach of warranty in connection with a gas-plant supplied to their collieries at Aber, near Pontypridd. Defendants denied the allegations. A report of the earlier part of the proceedings was given on p. 412 of the last issue of the "JOURNAL."

There appeared for the plaintiffs, Mr. LESLIE SCOTT, K.C., M.P., Mr. INSKIP, K.C., and Mr. HENN COLLINS; for the defendants, Mr. LANGDON, K.C., Mr. A. J. WALTER, K.C., and Mr. E. H. TINDAL ATKINSON.

Mr. LESLIE SCOTT (continuing his opening) said when it was found that the plant was faulty a number of tests were made. At the end of July, 1914, very careful tests were made by Professor Burstall, the well-known gas engine and producer expert. Various troubles arose. These tests, too, were made with Wyndham nuts—the dust having been first screened out. This, of course, would not be a commercial proposition, because the contract intended the use of Wyndham small coal. The screened nuts were worth 15s. a ton, against 6s. unscreened. To screen the coal would be to throw away the whole of the advantages expected from the use of the gas plant. To make doubly sure, they had other tests made by Mr. Lymn, an expert of great experience in bituminous coal; and these bore out the results of Professor Burstall. There was, in fact, no kind of coal at the colliery which could be used with the plant and produce the contract results.

Mr. *W. D. Wight*, a mining engineer, said he was General Manager of plaintiffs' colliery for 23 years. He negotiated with Mr. Baskerville, defendants' representative, as to the contract for the gas-engines and plant, and distinctly told him that the coal to be used was coal they were going to get from the Penllwyngwent colliery, and the nearest to that was coal which was got from the same seam at Wyndham. The plant had never developed the power which was necessary for the colliery purposes, and a large number of complaints were made from time to time of the engines and the gas-producers. The result of the failure of the plant was a reduction in output, difficulties with the workmen, and increased working expenses

Mr. *W. T. Hawken* (who was in Messrs. Cory's service from 1909 to 1911) said while he was with plaintiffs he did his best to make the gas plant a success. Defendants had complete liberty to make what alterations and additions to the plant they might think desirable. They were also allowed to have whatever coal they required.

Mr. *F. W. Trebarne*, a consulting analytical chemist of Cardiff, said he made tests of the gas in the producers in May, 1913; and he found the results very much lower in calorific value than those which were provided for in the contract.

Chester Corporation and the Water Company.

Last Tuesday, a motion in the action of the Chester Corporation *v.* Chester Water-Works Company came before Mr, Justice Eve, in the Chancery Division of the High Court, to continue an injunction which had been granted over that day, until the trial of the action or further order. Mr. Macmorran, K.C. (with him Mr. MacSwinney), said he understood that defendants desired a fortnight's adjournment, and that they were willing to give an undertaking that they would not during this time interfere with the streets. Mr. Dighton Pollock (for the defendants) said if the case was adjourned his clients would consent not to take any steps towards laying a cable or disturbing the streets. His Lordship ordered the motion to stand over for a fortnight.

Gaol for a Meter Thief.—At the Belfast Police Court, Robert Donaldson pleaded guilty to maliciously damaging a gas-meter in his house and stealing therefrom a sum of money. Accused, who said he broke the lock with a poker while he was under the influence of drink, was sent to gaol for three months.

Calorific Standard for Maryland.—The Maryland Public Service Commission have adopted an order setting forth rules for the regulation of the gas companies of the State in general, and the Consolidated Gas, Electric Light, and Power Company of Baltimore in particular. A heating value of 600 B.Th.U. is made the standard; and as this is less than that hitherto furnished in Baltimore, they rule that unless the Company voluntarily reduce their rate when the new standard becomes effective – viz., 5 c. net per 1000 cubic feet—the Commission will not permit a single standard of heating value to become effective in Baltimore, but will adopt the double standard of quality of gas, to be maintained by the Company at the present rate, until the Commission can investigate the matter. The order requires the Company to state within five days what they will do, and says that failure to give notice to the contrary will be construed as an acceptance of the terms of the order. There is, however, no legal requirement that the Company shall accept the order at once, as the law gives 60 days within which an appeal to the Courts can be taken. In discussing the reason for a heating value standard, the Chairman of the Commission said testimony showed that in Baltimore City and in Maryland generally it is estimated that from 90 to 94 per cent. of the total consumption of gas is for heating purposes, and that only from 6 to 10 per cent. is used with flat-flame burners for illumination.

MISCELLANEOUS NEWS.

MONTE VIDEO GAS COMPANY, LIMITED.

A Good Increase of Gas Consumption—Heavy Fall in the Price of Coke—A Black Outlook for Coal.

The Ordinary General Meeting of the Company was held last Wednesday, at Winchester House, Old Broad Street, E.C.—Mr. CHARLES HUNT in the chair.

The SECRETARY (Mr. Henry Kearns) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN, in moving their adoption, said the circular-letter which accompanied the interim dividend warrants would have prepared the shareholders for a less favourable statement of accounts on this occasion than they had been in the habit of receiving; and he ventured to think that the first feeling at all events would have been one of relief—it certainly had been so to the Board—that the statement now submitted was by no means the worst that might have been anticipated from the very exceptional conditions under which the Company had been operating. The outbreak of war early in August found Monte Video already suffering from a financial crisis, which, speedily becoming acute, resulted in a rapid reduction in the number of gas consumers, accompanied by an increase of bad debts, and a rather heavy loss on the rate of exchange. That the Directors were able to report that, notwithstanding these adverse conditions, the consumption of gas had not only held its own, but had actually advanced, would, he thought, be regarded as satisfactory evidence of the soundness of the business. It was true that the number of consumers at the end of the year showed no improvement; the falling-off during the last few months having exactly counterbalanced a large addition that had been made earlier in the year. But, as would be seen from the figures in the report, the gas consumption fell off only in the rate of its increase; the returns for the whole year showing an advance over those for the previous year of no less than 9·62 per cent. Had it not been for the unfortunate turn of events, it was but reasonable to assume that this comparison would have been much more favourable; the increase for the first six months having been as much as 13·17 per cent. It was certainly a disappointment that the promise with which the year opened was not fulfilled, and that the development of the gas business had received a check. But it was fully believed that, with the return of more normal conditions, the demand for additional installations would again revive. He was glad to be able to add that, for the first three months of the present year, the returns showed that the Company were at all events not losing more ground. No doubt it would be understood, from what had been stated at these meetings from time to time, that the whole—in fact, much more than the whole—of any increased consumption now obtainable was for purposes other than lighting, and for which purposes a lower rate was charged. For this reason, the increase in revenue was only 6·80 per cent., compared with the increase of 9·62 per cent. in the sales, although this represented, together with increased meter and stove rental, the very respectable sum of nearly £5000. The Dock Department had also showed improved receipts, amounting to nearly £3500; but against these there had unfortunately to be set a very serious reduction of receipts from the sale of coke and coal, amounting to more than £11,000, while additional income-tax and provision for bad and doubtful debts, together with loss on exchange and interest on loans, had further contributed to a reduction of profits, as compared with those of the previous year, of £5005. Broadly speaking, then, the outstanding features of the trading account were: Substantial improvement in each of the two branches of the Company's business—gas and dock; and a heavy slump in coke, by which the improvement had unfortunately been very much more than neutralized. The slump would not appear strange to those who were aware how unsaleable coke was in this country last year, and of the huge accumulations of it which resulted. But he ought to tell the shareholders that the position in Monte Video had been greatly aggravated by the breaking out of what could hardly be described as other than an insane competition among the coal importers, who for a time played a veritable game of "beggar my neighbour." In this the Company, as a matter of course, took no part; but the price of coke naturally followed that of coal, and the Company's position as involuntary producers of it left the Board no other choice than to sell it at the best prices obtainable. Recently, however, there had been a noticeable improvement under the sobering effect of a scarcity of coal, and prices were distinctly better. The net result was a sufficiency of profit to pay a dividend for the whole year of 3 per cent., which was less by 1 per cent. than the dividend paid for the two previous years. It was always more pleasant to go forward than to go back; and, needless to say, it would have given the Directors much pleasure had they been able to do so on this occasion, or, at all events, to have maintained the previous rate. The dividend, however, which was recommended had at least the merit of having been fully and fairly earned; and under circumstances which might have called for even a smaller distribution with the object of conserving their resources. It should, moreover, be considered in its relation not only to the capital of the undertaking, but also to the business by which it had been earned. The payment of even so slender a dividend as 3 per cent. meant a charge per 1000 cubic feet sold greatly in excess of that which sufficed for payment of statutory dividends at home. The primary reason for this was that the cost of erecting works in South America was very heavy compared with the cost in this country. But, even allowing for this, there was an overburden of capital, for which the present Directors were in no way even remotely responsible, and which it had been, and would continue to be, their aim to reduce by increase of consumption without proportionate increase of capital, as being the only means by which, in their opinion, the continued stability of the undertaking could be ensured. The top figures on the right-hand side of the balance-sheet showed that the capital expenditure had been increased

during the year by a small amount only—viz., from £539,915 to £541,342, or £1427, although to this had to be added £1710, being the balance of expenditure on cookers and other appliances taken into stock, and making a total for the year of £3137, or much less than 1 per cent. on the gas capital, compared with an increase in gas sales of nearly 10 per cent. This meant an appreciable reduction in the rate of total expenditure per million cubic feet sold, and was therefore quite in the right direction. But with a growing consumption—such as it was hoped would be again experienced with the return of more favourable conditions—additional capital became a constant necessity. There were many more miles of mains to be laid, and a great many more cookers had to be provided, in order to satisfy the normal growth of Monte Video; and it would therefore be quite easily understood that the question of how to meet their increasing capital requirements had already become somewhat pressing. Under ordinary conditions, recourse could have been had to the securities in which the various funds of the Company were invested. But to dispose of these at the present time was quite out of the question. Accordingly arrangements had been made with the Company's bankers for a loan by them for present requirements. Hence the entry on the other side of the balance-sheet of "Loan from bank, £12,250." The arrangement made would, it was expected, cover also payment for the new retort-house, the cost of which had been already largely, if not wholly, provided for by the renewal fund. Contracts for this work were entered into just previous to the war, and consequently at pre-war prices; while the freightage of material was also successfully negotiated by the Secretary just prior to the great advance in freights. This retort-house, the erection of which had been for some time in contemplation, but had to be postponed owing to the projection of the embankment scheme, now definitely abandoned, was intended to replace the existing old carbonizing plant, and with its up-to-date appliances should be the means of effecting a considerable saving in the cost of manufacture. It was deserving of mention, as evidence of the efficient management of the works, that the average gas production last year per ton of coal carbonized was, with the existing plant, as high as 12,048 cubic feet—a figure which, he was sure, would appeal to gas men as being very satisfactory. He might say the cost of coal for the year, including freight and all other charges, was about 8¼d. per ton less than for the previous year. But unfortunately all hope of further economy in this direction had for the present disappeared; and instead the Directors were now confronted with such an enormous rise in the cost of both coal and freights as to be a serious menace to future profits. As regards coal, their requirements were covered for a considerable portion of the current year by a contract at last year's rates. But freights had to be arranged for at the time of shipment, and the very serious advance of practically 100 per cent. which had already been paid for these had necessitated an increase in the price of gas used for cooking and heating from 6 c. to 7 c. per cubic metre. It was with the greatest reluctance that the Directors decided on taking this step; but the great increase in the cost of their raw material left them no alternative. Relatively, however, to the present selling price of coal in Monte Video, the use of gas at the new price should prove even more economical to consumers than it was at last year's prices of gas and coal. As to what might happen later in regard to coal supplies, it was impossible to say; but the shareholders were doubtless aware that, with the object of remedying the undoubted shortage of output, the Government had decided to prohibit exports to neutral countries. This, however, could hardly be meant to apply to a British owned undertaking such as this was, upon which the stoppage of coal supplies from England would inflict far greater injury than any benefit likely to result therefrom to English consumers could by any possibility justify. Following the course which had this year been generally adopted by the banks, the investments had been valued as on July 27, 1914; the depreciated value appearing at that date being charged as usual to the contingency fund. He ought not to omit to mention that the unaccounted-for gas had been reduced during the last two years from 9·34 to as low as 5·30 per cent.—a figure which compared favourably with a good many undertakings at home, and which could not be but considered as highly creditable to the management at Monte Video, especially having regard to the consumption per mile of mains—this being much smaller than usually obtained at home. With the addition of 5¾ miles laid last year, the total mileage of mains was now 137. He should also like to say that early last year the Company were granted permission to erect in the Port of Monte Video four 3000-candle power high-pressure lamps of the latest type, which made their first appearance at the International Gas Exhibition in the previous October, and which the Company were the first to send abroad. These had successfully withstood the fiercest storms ever known in Monte Video; and he was pleased to say that, after a very lengthy trial, the news had just reached the Board that the authorities had decided to retain them. The position in which the lamps were placed was a very important one, being much frequented every night by passengers who embarked for Buenos Ayres, and also by their friends. It was satisfactory to have been able in this way to prove the suitability of gas for lighting large and important areas. In conclusion, he added that the Board were arranging for the Company's General Manager, Mr. Lane, to pay a visit to England this summer. Mr. Lane was over here two years ago; and the Directors felt that the time had arrived when another conference with him was desirable.

Mr. JOHN MEWS seconded the motion.

Mr. THOMAS DENCE asked whether the Board were able to charge an increased rate for gas to compensate for the higher price of coal. Also, supposing coal could not be obtained from England, could it be secured from America or anywhere else?

Mr. T. WILKINS said he looked upon the position of the Company as satisfactory, seeing that one large gas company working in South America had had to pass the ordinary dividend, and were only able to pay the interest on their debentures.

The CHAIRMAN, having expressed his appreciation of Mr. Wilkins' remarks, said he mentioned in his opening observations that the Board had already raised the price of heating gas from 6 c. to 7 c. per cubic metre. The Company had unlimited power of charge—subject to prudential consideration; for if they charged too much for gas, they would lose the consumption. He did not think the increase made would prejudice them with their consumers. If the Company were unable to get coal from England, no doubt they would be able to obtain it at a price from America. But the American coalowners knew as well as the English ones how to charge when the opportunity occurred. He was afraid the price at which the Company could get coal from America would not be at all a favourable one, having regard to the excessive cost of freight.

The motion was unanimously carried.

The CHAIRMAN proposed, and Mr. FRANK JONES seconded, the declaration of a dividend of 6s. per share, less income-tax, making with the interim dividend 3 per cent. for the year.

Moved by Mr. JONES, and seconded by Mr. W. EDGAR HORNE, M.P., the retiring Directors (Mr. Mews and Mr. Hunt) were re-elected.

Proposed by Colonel A. G. HIPWELL, C.B., and seconded by Mr. DENCE, the retiring Auditors (Mr. Laurence E. Halsey and Mr. W. C. Sneath) were re-appointed.

The CHAIRMAN moved a vote of thanks to the staff. He remarked that, though the difficulties of their task had been great at home, those attending the operations of the Company abroad had been greater still. He could assure the shareholders that in Mr. Lane they had a General Manager of whom any Company might be thoroughly satisfied. He occupied an excellent position in Monte Video; and he had faithfully attended to the operations of the Company for nearly 25 years. He had the entire confidence of the Board, and was well seconded by the staff. He (the Chairman) was sure Mr. Lane was deserving of their best thanks. The Company were equally well served at home by their Secretary, Mr. Kearns.

Mr. DENCE seconded the motion, which was cordially agreed to.

The SECRETARY briefly responded.

Moved by Mr. DENCE, and seconded by Mr. F. W. CHURCH, a hearty vote of thanks was also passed to the Chairman and the Board.

SOUTH BARRACAS (BUENOS AYRES) GAS COMPANY.

The Ordinary General Meeting of this Company was held at the London offices last Thursday—Mr. J. C. IM THURN (the Chairman of the Directors) presiding.

The SECRETARY (Mr. W. Upton) read the notice convening the meeting and the report of the Auditors. [Some particulars from the accounts were given in the "JOURNAL" for the 18th inst.]

The CHAIRMAN, in moving the adoption of the report and accounts, said the Company's business had been carried on throughout the year in a state of extreme anxiety, and he was afraid that so long as the prevailing conditions continued no decided change for the better could be looked for. The great falling-off in the amount of business done was shown by the reduction in the gas receipts of £5583 through lessened consumption, and residuals had brought in £2982 2s. 11d. less owing to the lower prices obtainable. The lessened sale of gas during the year amounted to 11,029,000 cubic feet; but it was evident that this was almost entirely due to the effects of the enforced economy exercised by the consumers, as out of a total of 5358 meters in use for lighting and cooking there had only been a small decrease of 331. The Directors therefore concluded—and, in fact, they were assured by the Manager, Mr. R. B. Brown—that the decreased consumption could only be of a temporary character. The general falling-off in the business had made it very important to reduce working expenses to the lowest possible point consistent with the interests of the Company; and the revenue account showed that much had been done in this direction. While every care was being exercised to reduce capital expenditure to the lowest possible point, it was, of course, most undesirable to refuse to supply consumers when application was made, or they would be lost to electricity. Though every branch of the Company's business had suffered more or less, particularly the sales of apparatus in the show-rooms, it was an encouraging sign that the cookers on hire increased from 1231 to 1316, and that there was a small addition to those sold on hire-purchase agreement and 11 sold outright. As to the prospects for the current year, the times were so abnormal, both in England and in Argentina, that he preferred not to prophesy; but everything possible would be done, and the greatest vigilance exercised in order to protect the interests of the Company. Recent letters from the Manager gave evidence of a very considerable increase in the sale of gas and in its use for cooking; and a cable just received was to the effect that local conditions showed signs of improvement.

Mr. J. M. MACMORRAN seconded the motion, and it was carried unanimously without discussion.

A vote of thanks was accorded to the Chairman, Directors, local Committee, and staff, and the proceedings closed.

CAPE TOWN AND DISTRICT GASLIGHT COMPANY.

Vertical Retorts and Colonial Coal.

The Twenty-Fifth Ordinary General Meeting of the Company was held last Wednesday, at the London Offices, Egypt House, New Broad Street, E.C.—Mr. J. E. LILLEY, J.P. (the Chairman), presiding.

The SECRETARY (Mr. R. W. Blackburn) having read the notice convening the meeting, the report [some particulars from which were given on p. 419 of last week's "JOURNAL"] and the statement of accounts were taken as read.

The CHAIRMAN, on rising, read the report of the Auditors attached to the accounts, in the course of which it was remarked that—"No specific provision has been made out of the profits of the year for depreciation of 'Works, buildings, plant, &c.;' but the sum of £6180 has been written off 'New retort installation.'" With regard to this, he pointed out that nothing whatever had been charged to capital account for some years past, although very large sums of money had been spent in adding to the assets, in the shape of new mains and services, fittings, &c. This had all been paid for out of revenue; and even if they had not written-off this substantial amount of £6180 from the cost of the new vertical retorts, there would still have been no necessity to write

off anything in respect of depreciation of works. No doubt, the Auditors had some good reason for the manner in which they had worded their certificate; but in case any misapprehension might be caused in the minds of shareholders, it seemed advisable he should tell them he did not think the remark in question was intended to indicate that, in the opinion of the Auditors, anything should have been written-off capital account. Had he believed it was meant to bear this construction, he should have had something more to say on the subject. In the next place, he wished to express the very great regret which the Directors had felt at the loss by death of Mr. A. C. F. Gore, who had been a Director of the Company in Cape Town ever since they started business. He was very well known out there, and was able to be of great assistance to the Company on many occasions. The vacancy had been filled by the appointment of Dr. Bennie Hewat, who was a thoroughly capable and reliable man possessing sound judgment. He was a representative of Cape Town in the Legislative Council. It was in no small degree owing to his knowledge of the matter, and the interest he took in it, that such wise legislation had been secured affecting the business of the Company. Proceeding to move the adoption of the report and accounts, he remarked that the shareholders would have noted that the year's trading had resulted in a profit of £652 larger than that for the preceding twelve months; the profit on revenue account being £17,653 in 1914, as compared with £17,001 in 1913. This result could not be considered as otherwise than good, though personally at the beginning of the year he expected that things would have made an even better showing. But this was before the war. They had made good contracts for coal, and expected the new vertical retorts (from which great savings were expected) to be in their charge at the beginning of the year. They were, however, disappointed in the latter matter; for the retorts were not handed over to them until the best season of the year (which was from May to August) was passed. In entering into the contract for the plant, the Board had allowed fourteen months for its completion; and it was thought this would be sufficient to cover every contingency. They knew that by arranging for the new retorts to be ready by November, 1913, they were leaving themselves a very good margin between that date and the heavy demand the following May. They were not left in an impossible position by this delay in completion; but they had suffered very considerable inconvenience and expense, as well as a loss of the profit which should have been derived from the use of these retorts. The Directors were making a claim in respect of the delay, and had had negotiations with the contractors; and it was his hope that they would arrive at a friendly settlement. However, as he had said, notwithstanding these disadvantages, the Company had had a fairly good year. Some ill-effects had been suffered by them from the war, because legislation was immediately passed requiring the closing at 6 o'clock every evening of all shops except a very few which carried on special trades. Consequently, these shops had no need whatever to use artificial illumination. Then, of course, many men were drawn away from the neighbourhood, and this affected boarding-houses, which were very good customers of the Company. The extent to which the trade of the Colony had suffered was shown by the figures of exports and imports. In 1914, the exports fell over £27,000,000 in value, and the imports nearly £7,000,000. This proved that there had not been at all a normal condition of affairs in Cape Colony; but the Company had not been so seriously affected, considering these conditions. The Board had done everything they could to encourage all those who desired to do so to enlist; and special arrangements had been made with regard to salaries and wages for them, and also for those called up as reservists by the Government. There was being handed over to their families while they were absent, on account of wages and salaries, such a sum as would make up deficiencies in military pay. Every effort would be made to find openings so as to reinstate when they came back again all their men who had gone to the front. With reference to the new vertical retorts, they were bound in fairness to admit that they were good, and that the contractors had done their work well. The retorts were found to be economical in the matter of working; and they rendered possible the use of cheaper coal than could otherwise be employed. The gas yield, too, was very good considering the quality of the coal. The results from them were not so good as would be obtained from the use of English coal; but with the inferior coal they were employing, the results did approximate to what they secured from the old retorts when carbonizing very much more expensive English coal. In the past year they had used more than three-quarters Colonial coal; and this year they hoped to use it entirely. It was the wish of the Board that they might continue doing so through the whole of the year. It was cheaper now than it was last year. Arrangements had been entered into on favourable terms covering the whole of the twelve months; and up to the present time, so far as this year was concerned at any rate, no difficulty had been experienced in getting delivery. Two new contracts of a rather important character had been secured by the Company. They had not begun working them yet; but matters were going on as fast as they possibly could. One contract was for the Government Railway authorities, at Salt River—not quite within the district which the Company generally considered to be theirs. An extension of the main had, however, been made for the purposes of the supply. The other contract entered into was with the authorities of the Alexandra Hospital, which he had seen described in the Press as a very large and fine building. At present it was being used as a military hospital. The Company had received a large order for gas appliances to be put in. A special main would be laid to supply the hospital; and the consumption would, it was hoped, amount to several million feet a year. Great praise was due to the officials who had arranged this matter, for the good sense and the skill they had displayed. Turning to the revenue account, it would be seen that during last year the cost of manufacture and distribution of gas was nearly £4000 less than in the previous twelve months. A large portion of this saving was on account of the cheaper coal carbonized; and some part had arisen from the better results that had been secured from the working of the new retorts since August. On the other side, the gas sold amounted to about

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£1800 less than for the previous year. This was owing to the falling off in sales. Residuals showed a return of £300 less; and he thought they were very fortunate in getting so near as this. Coke had been a very poor market throughout the year; and it was still rather difficult to sell. And there would now be considerably more coke to dispose of, because of the saving of fuel with the new retorts. After explaining the smaller charge on the present occasion for repair and maintenance of works, plant, mains, &c., and referring to the fact that the Government of the Union of South Africa had found it necessary last year to impose an income-tax, which constituted an additional charge on the Company's profits, he said they had to thank their officers for having given them the greatest assistance they possibly could in every respect. It was only right that they should testify to the loyalty and good service they received from them. With regard to the present year, of course there were unpleasant possibilities to face. There might be a decreased consumption of gas; but even if this should take place, the Directors still felt they were pretty well assured at any rate of a fair profit for the year's working. There were some good points in their favour. There was no very heavy expenditure to face during the year; and altogether he thought they might safely look forward to a very fair working result.

The VICE-CHAIRMAN (Mr. H. R. Savory) formally seconded the motion for the adoption of the report and accounts, and it was at once carried unanimously.

Mr. J. L. CHAPMAN proposed a vote of thanks to the Chairman and Directors. He said it seemed to him to be true that things looked better than they appeared upon the balance-sheet; and he congratulated the Board upon the straightforward policy they had pursued in writing-off the whole cost of the new retorts. There was nothing like clearing away a matter of this kind. The decreased cost of coal and the increased producing power of the retorts were good features. He thought they might look forward to having, when the war came to an end, much better prospects in the future.

Mr. C. J. MOORE seconded the proposition, and it was agreed to.

The CHAIRMAN, in acknowledgment, said they had had very hard times indeed to go through for some years past, and they had had to struggle in the direction of putting the Company on a thoroughly sound basis. They had foregone immediate benefits in order that the future might be well assured. Personally, he thought it was well assured now. With regard to the debentures, as mentioned in the report, the Directors had redeemed £5000 during the year. When the war broke out, negotiations were in course of progress for the transfer of the 6 per cent. debentures from the present holders to other hands, so that the redemption, by being fixed at a smaller amount each year, might run over a longer term. Unfortunately, these negotiations broke down owing to the war; and the Board had since been trying to come to some arrangement. Now, he thought they had at last done so. Proceedings were going on; and he hoped they would not have to redeem so large a sum as £5000 a year in future. This would be a saving in cash which would go to the benefit of the shareholders.

LEIPSIC GAS UNDERTAKING.

Report for the Year 1913.

The report of the Leipsic gas undertaking for the year 1913, which has only recently been issued, shows that the output of gas from the four Corporation gas-works was 57,674,490 cubic metres (2037 million cubic feet), which is an increase of 2·3 per cent. on the output in the previous twelve months. The consumption per head of the population works out at 3065 cubic feet per annum. Coke fetched on the average about 2s. 6d. per ton more than in the previous year, and higher prices also were obtained for tar, spent oxide, and sulphate of ammonia.

Of the coal carbonized 46·73 per cent. was from Saxony, 45 per cent. from Upper Silesia, 3·61 per cent. from Lower Silesia, 4·11 per cent. was Westphalian, and 0·50 per cent. was English. The average make of gas per ton of coal in the horizontal retorts was 10,902 cubic feet, and in the carbonizing ovens 11,669 cubic feet. The output of sulphate, of 24·5 per cent. content of ammonia, averaged 0·855 per cent. by weight of the coal carbonized for three of the works, and 0·927 per cent. for the fourth works. The gas distributed was free from ammonia. The consumption for different purposes was as follows: Public lighting, 7·8 per cent.; ordinary lighting consumers, 39·4 per cent., for power and heating, 40·5 per cent.; prepayment meter consumers, 3·2 per cent.; municipal and public buildings, 4·4 per cent.; works' use, 1·1 per cent.; unaccounted-for, 3·6 per cent. The receipts of the undertaking for the year show a surplus of 1,655,020 marks (about £81,128), of which 350,000 marks have been allocated for street maintenance work.

PROGRESS OF DYE MANUFACTURE IN AMERICA.

According to a statement by Mr. Thomas H. Norton, of the United States Bureau of Commerce, there has been great advance during the past few months in the production of dye-stuffs. Efforts are being made to increase the output of benzol; and contracts have been placed by one company for 92 additional bye-product coke-ovens, with complete equipment for benzol recovery, at an outlay of about £200,000. It is expected that the daily production of benzol in the Pittsburgh district will soon exceed 20,000 gallons. The recovery works of the United States Steel Corporation at Erie (Ind.) are producing 12,000 gallons of benzol per day. Additional recovery plants are under construction in connection with the coke-works of the Republic Iron and Steel Company, at Youngstown (Ohio), of the Lackawanna Steel Company, at Buffalo (N.Y.), and of the Inland Steel Company at Inland Harbor (Ind.) The Benzol Products Company have nearly completed at Marcus Hook (Pa.) extensive plant which is to be devoted to the manufacture of intermediates on a large scale. It is hoped to produce

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	ins.	ins.	ins.	ins.	ins.	ins.	Grill. / Boiling				
1	18	12½	11½	32½	20	14½	1 / 2	35/-	7/6	2/3	10/-

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in these works most of the aniline oil and salts required by American colour-works. Another company has been established for the manufacture of sulphur colours. The Cambria Steel Company are planning to erect at once plant to manufacture dye-stuffs, using as raw material the 6 tons of benzol and its homologues yielded daily by their coke plant. Several firms commanding ample capital are maturing plans for definitely establishing new plants for the production of artificial dye-stuffs.

The existing American factories for manufacturing coal-tar dyes are making every effort to increase their output, though much hampered by difficulty in obtaining raw material during the last few months. It is regarded as certain that production will grow rapidly as more ample supplies of benzol, &c., are assured, and various obstacles incident to the complete cessation of the import of intermediate products from Europe are overcome.

TIPTON GAS UNDERTAKING.

Important matters concerning the Tipton gas undertaking were dealt with by the District Council at their meeting last Tuesday.

The Gas Engineer (Mr. W. Prince) presented a report in which he pointed out that a contract had been arranged between the department and the Rowley Regis Gas Company for a supply of gas to the Tividale portion of their area, for a period of five years, and a great liability would be incurred if there should be a failure of supply. It was an urgent matter that provision should be made by putting the carbonizing plant into good order straight away. He recommended the conversion of the blue water-gas plant to carburetted water-gas plant, increasing the capacity to 500,000 cubic feet per day. By this means gas of any required candle power could be made. There were several essential reasons why this proposal should appeal to the members of the Committee. The approximate cost would be £2137. He further recommended that the existing lift to the vertical retort installation be extended to the level of the tops of the coal-bunkers, at a cost of £250. He suggested that the sum to be spent be advanced to £3500, to meet the outlay on a sulphate of ammonia plant, additional cooking stoves, and meters.

By the casting vote of the Chairman, the Gas Committee adopted the proposal for the conversion and extension of the present blue water-gas plant into a carburetted water-gas plant. The Committee considered the question of the appointment of a consulting gas engineer to assist them in their deliberations with respect to the extension of the plant; but a resolution to engage such an official was lost.

At the Council meeting, Mr. Shephard (in the absence of Mr. Doughty, the Chairman of the Gas Committee) moved that the report be adopted, with the exception of the paragraphs relating to the water-gas plant. The resolutions were carried; and the clause relating to a consulting gas engineer was deleted, so that it could later on be further considered.

THE PRICE OF GAS IN THE TOTTENHAM DISTRICT.

At the Meeting of the Tottenham District Council last Tuesday, the General Purposes Committee reported that, as a result of the Council's opposition to the Tottenham and Edmonton Gas Bill of 1913, the Company gave an undertaking to the effect that the price of gas during the then ensuing three years should not exceed 2s. 1d. per 1000 cubic feet, and further that on Jan. 1, 1914, the price should be reduced to 2s. The latter part of the undertaking had been duly fulfilled, it was pointed out; and the price of gas still remained at 2s. per 1000. The officers of the Company had, however, interviewed the Clerk of the Council and the Engineer, and had requested the Council to release the Company from the undertaking, in view of the unanticipated increase in the cost of coals and of the extra expenses which the Company are committed to in consequence of the war. They recommended that the Company should be informed that the Council would not consent.

On the motion to adopt the report,

Mr. FROST pointed out that in the case of coal merchants, corn dealers, and others with whom the Council had entered into contracts, the Council had in every case allowed them to charge extra, owing to the effects of the war. He thought they should be consistent. He therefore proposed that the recommendation should be referred back—adding that he was not a shareholder in the Company.

Mr. ELDERFIELD urged that the undertaking was given as a *quid pro quo* for the Council withdrawing their opposition to the Company's Bill, by which the Company had probably saved more than enough money to cover the present extra cost of gas-making material.

The amendment was lost, and the Committee's recommendation was adopted.

The "Tottenham and Edmonton Herald" has devoted a leading article to the subject, and in the course of some strong comments said: "Mr. Elderfield's argument was that the arrangement made with the Company was a special one, because the Council consented to withdraw opposition to the Company's Bill in Parliament, the object of which (apart from the payment of dividends to investors) was to cheapen the supply of gas to the public. This benign action of the Council it was suggested had saved the Company considerable expenses, which possibly covered more than they were now asking to obtain by a slight temporary increase in the price of gas for public lighting. Now we hold no brief for the Company; but we are bound to put the other side of the case as far as the Council is concerned. Is Mr. Elderfield at all sure that, if the Council had spent public money in opposing the Bill, which was favoured by four neighbouring authorities, it would not have spent the money in vain? Of course he cannot be; and in refraining from spending it, the public got the benefit of what otherwise might have been money wasted, as well as a cheaper supply of gas. Why, then, not be as fair to the Company as to other people?"

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MANAGEMENT OF THE STOCKTON GAS UNDERTAKING.

Proposed Changes of Administration.

About a year ago the Stockton-on-Tees Town Council appointed a Sub-Committee to report upon the position of the gas undertaking, with the view of obtaining, if possible, an improvement in its administration. The Committee held seven meetings, and the results of their investigation have been embodied in a report which has been presented to the Council. No action has, however, been taken upon it, as it has not been considered by the Gas Committee. The Sub-Committee divided the matters left to them under the following heads: (1) Management staff; (2) workmen; (3) system of book-keeping; (4) prices charged to consumers for gas, coke, and residuals, and the method of sale in operation; and (5) miscellaneous. A large amount of information was obtained; and the Sub-Committee make the following recommendations.

With regard to the management, they are strongly of opinion that the old system, under which there was one General Manager, who was responsible for both inside and outside work, should be reverted to, as they consider that the system of dual control which has been growing up of late years is not in the best interests of the undertaking. They are further of opinion that one outside foreman is sufficient, and that there should be one general works foreman having a thorough knowledge of gas-producing and bye-products work. It is suggested that a reduction might be made in the number of workmen employed, and in the present "excessive and unnecessary amount of overtime." In the accounts department, the Sub-Committee say the system under which certain books are kept at the gas-works and others at the Borough Accountant's office has not worked very smoothly; and they consider that all books relating to the management of the works should be kept there. They recommend that the books from which periodical returns are required by the Borough Accountant should be kept on the duplicate loose-leaf system. The Sub-Committee do not make any recommendation in regard to the prices charged for, and the method of selling, gas, coke, and residuals. Coming to the subject of complaints, at present all those relating to defective meters, stoves, and cookers are made at the Town Hall and are sent on to the gas-works. This system seems to the Sub-Committee to be open to objection; and they recommend that complaints should go to the gas-works direct. Stoves and cookers are now sent to the makers for repairs; and the Sub-Committee think that, except in special cases, these should be carried out at the gas-works by a department to be formed for the purpose. It is considered that a better method of keeping a record of all meters, fittings, &c., sent from the works might be established. The Sub-Committee are not satisfied with the system in vogue in regard to the collection of money from prepayment meters; and they will, at the proper time, recommend certain alterations which they think will effect a considerable improvement.

ROCHDALE GAS APPLIANCE SHOW-ROOMS.

Silencing the Critics.

At the last meeting of the Rochdale Town Council, several questions were put relating to the gas appliance show-rooms. One member asked whether the Gas Committee still considered the show-room a successful venture, seeing that it cost £4000 to purchase and equip, and that £14 a week was spent to draw £26 a week.

Councillor WALKER, the Chairman of the Gas Committee, said that in committee there had never been any dissatisfaction expressed with regard to the show-room venture. Speaking for himself, and also, he was glad to say, for the Gas Engineer (Mr. T. Banbury Ball), he could say that they had no regret whatever about the establishment of this department. The business being done was steady and regular, as the monthly returns showed. During April orders were taken for no fewer than 327 cookers. The returns from the opening until now could not be considered otherwise than very satisfactory indeed. Had it not been for the war, there would have been a great deal of visible evidence that the show-room was justifying itself. He admitted that in present circumstances the evidence was not visible; but that it was not there nobody could say. The establishment had only been working fifteen or sixteen months. During the first seven months they were overwhelmed with business, and it took them this time to get the new organization on its feet and working smoothly. Then came the war, and ideas which the Sub-Committee had about developing the show-room had to be dropped. A lot had been said about the gas undertaking not making its usual profits, and not handing over a substantial sum to the rates. Industries all over the country had been affected by the war, but none had been so disastrously hit as the gas industry.

Mr. WATSON (one of the questioners) said that what he challenged was the working of the show-room, the expense of maintaining which should, in his opinion, be considerably reduced.

Mr. WYCHERLEY reiterated that £14 was being spent every week to draw £26; and in this £14 no note was taken of capital outlay. Last year, he believed, the Chairman of the Gas Committee argued that they could not reckon the success of the show-room by the amount of the sales effected—it was to encourage the consumption of gas that the premises were opened. But there was not much progress in this respect, for the increased income from all gas sources during the past year was only £800.

Mr. SHAWCROSS did not think the question should be viewed from the peddling point of view of the critics. The Council approved the venture, and the Health Committee supported it, because they felt that the more gas was used for cooking, heating, &c, the less smoke there would be, and the purer the atmosphere would become. From such figures as Mr. Walker had given as to sales and the letting-out of cookers, it must be evident they would lead to a greater consumption

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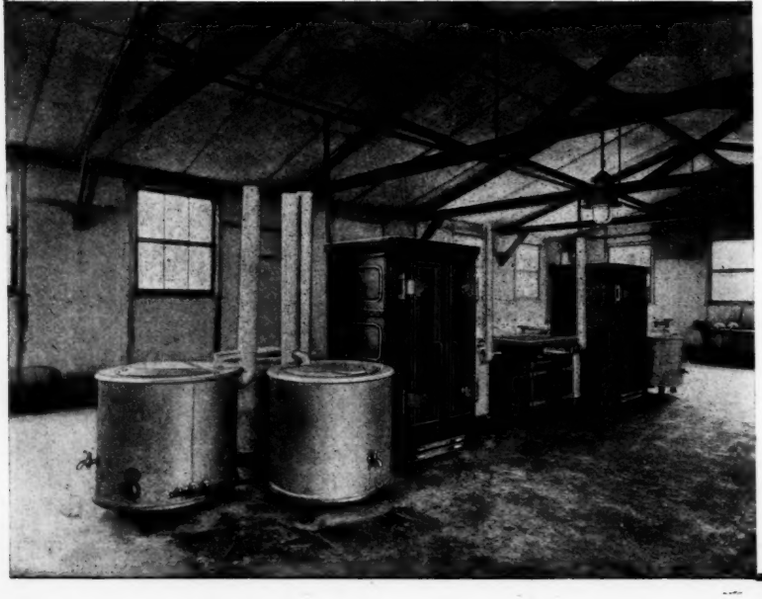

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of gas. He was all against selling gas at cost price; but he did not believe in making an excessive profit.

Mr. BLOMLEY, a member of the Gas Committee, remarked that if £26 a week was the total amount the Gas Committee expected to receive the show-room would be a failure. But they were catering for a much larger trade than this. Members of the Council must remember that the Gas Committee did not now rely so much as formerly on the sale of gas for lighting as on sales for cooking, heating, and power. He pointed out that since 1906 the Committee had spent £57,537, over and above ordinary repairs and renewals, in keeping the concern in working order. The cost of the show-room was being paid for, not from the rates, but from profits placed to reserve.

The discussion then dropped.

LEEK GAS UNDERTAKING.

Annual Report of the Engineer.

Mr. R. H. Ginman, who about a year ago succeeded Mr. S. Trow Smith as Gas Engineer and Manager to the Leek Urban District Council, recently submitted to the Lighting Committee his report for the year ended March 31. It furnishes the following interesting particulars.

The outstanding debt at the close of the financial year (with £379 placed to the sinking fund) was £21,216, compared with £21,677. The total income was £17,928, compared with £17,350—an increase of £578; and the expenditure was £14,806, against £14,182, or £624 more. The gross profit was £3121, and the net profit £451—the latter amount being £157 less than for the year 1913-14, owing to lower returns from residuals and other matters fully explained by Mr. Ginman. The net profit is equal to 14·706 per cent. on the capital, compared with 14·61 per cent. before. The quantity of gas sold through ordinary meters increased by 9,719,400 cubic feet, and that supplied on the prepayment system by 2,701,200 cubic feet; the increased rental being £547 and £458 respectively. The receipts per 1000 cubic feet of gas sold by ordinary meter last year were 2s. 4·23d., compared with 2s. 6·546d —a reduction of 2·316d , caused by the large increase in the use of gas for power purposes. The receipts for gas supplied through prepayment meters, on the other hand, were 2s. 7·676d., as against 2s. 6·878d. per 1000 cubic feet—a gain of 0·798d. The total expenditure on the same basis was 2s. 5·741d., compared with 2s. 7·966d., or 2·255d. less than before. This was brought about by the fact that some 13 million cubic feet more gas was sold and accounted for in the twelve months covered by the report than in the year 1913-14; coal actually costing £113 less than before.

The portion of the report relating to manufacture shows that the quantity of coal carbonized during the year was 10,650 tons, against 10,267 tons before—an increase of 383 tons, or 3·7 per cent. The make of gas was 127,836,000 cubic feet, against 116,537,000 cubic feet —an increase of 11,299,000 cubic feet, or 9·66 per cent. The make per ton of coal carbonized was 12,003 cubic feet, compared with 11,350 cubic feet, or 653 cubic feet more. This is the largest make per ton the Gas Department has ever had, and represents a monetary saving of £613. The quantity of gas sold and accounted for was 119,484,000 cubic feet, compared 106,475,000 cubic feet—an increase equal to 12·21 per cent. The unaccounted-for gas was 6·54 per cent, compared with 8·66 per cent. before, or 2·12 per cent. less. The gas sold per ton of coal carbonized was the highest and the best result in the history of the undertaking.

Mr. Ginman reports that gas cookers and fires are still in popular demand; and gratifying results in the way of selling smaller appliances have attended the opening of the new show-rooms in September last. During the year a coke breaking and screening plant was erected to meet a popular demand for a graded screened coke fuel, and it is believed that this will prove a very remunerative investment. To deal with the present output of gas, additional storage room is required; and Mr. Ginman points out that a new 500,000 cubic feet gasholder is urgently needed. He closes his report with an expression of regret that, owing to the abnormally inflated price of coal and the increasing cost of all materials and labour, an increase in the price of gas will be compulsory, notwithstanding the better working results.

The report came before the District Council on the presentation of the minutes of the Lighting Committee at the last fortnightly meeting, when Mr. Cope, referring to the reduced revenue from residuals, said he did not think the Gas Committee were selling in the best markets. During the war the prices of ammonia and sulphur products had gone up. Mr. Furmston (the Chairman of the Committee) said the prices were fixed by contract before the war, and if next year they could get anything like the prices Mr. Ginman and he would be very satisfied. Pitch had become an absolute drug on the market. At the present time the price of sulphate of ammonia was lower than it had been for twenty years. Mr. Shaw said he should like to congratulate the Gas Manager upon his excellent report. One thing to which he drew attention last year was the leakage, which he saw had been reduced by 1¾ million cubic feet, or 2½ per cent. He felt that every member of the Council would congratulate the Gas Manager upon so excellent a year's working. Mr. Furmston said he had expected to hear some remarks upon the proposal made by the Committee to increase the price of gas 4d. per 1000 cubic feet to the ordinary consumers. The Committee had not reduced the quantity supplied to the prepayment consumers, because it had been felt for some time that the difference in the charges was too much, and the proposed change would bring it down to a minimum. The minutes were passed.

The Dauntsey Water Company, Limited, has been registered with a capital of £5000, in £1 shares, for the supply of Dauntsey, near Chippenham.

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HEYWOOD CORPORATION GAS DEPARTMENT.

Report of the Engineer and Manager.

The report on the working of the Gas Department of the Heywood Corporation for the year ended the 31st of March last has been presented to the Gas Committee by the Engineer and Manager (Mr. W. Whatmough). It furnishes the following particulars.

The gross revenue amounted to £23,375, and the gross expenditure (less interest and sinking fund) to £17,181; leaving a profit of £6194, or a decrease of £569 compared with the year 1913-14. The amount paid for interest and sinking fund was £6151; leaving a net profit of £43. The receipts, &c., for gas sold were £18,221, compared with £18,711, or a decrease of £490. Prepayment meters and stoves and gas for motive power show an increase of £237 and £40 respectively; while the revenue for high-pressure outside shop lighting gives the substantial increase of £134, due to the plant being in operation for only a portion of the previous year. In the receipts for residual products, there was again a heavy decline—tar and sulphate of ammonia amounting to £514. On the other hand, there was an increase of £135 in coke; leaving a net reduction of £379. The expenditure on the manufacture of gas was £11,562, or a reduction of £427, due to a decrease in the cost of coal and the use of an inferior quality of coal in the vertical retorts. Other items of expenditure are very similar to the previous year, with the exception of "rates and taxes" which again show an increase; the amount paid being £2598 against £2463, or an increase of £135. During the year 11,821 tons of coal and 54 tons of cannel were carbonized, or a total of 11,875 tons, against 12,167 tons for 1913-14—a decrease of 292 tons. The gas made per ton of coal carbonized was 12,130 cubic feet, compared with 12,196 cubic feet for the previous year. The quantity of benzol used was 2743 gallons, against 5004 gallons—a decrease of 2261 gallons. The total quantity of gas manufactured amounted to 144,768,000 cubic feet, or 3,630,000 cubic feet less than in 1913-14; and the total quantity sold, as registered by the consumers' meters, was 132,117,796 cubic feet—a decrease of 4,797,986 cubic feet. The unaccounted-for gas was 9,640,624 cubic feet, or 6·65 per cent. High-pressure outside shop lighting continued to find favour last year, 14 additional lamps of 1000-candle power having been fixed. There are now 58 lamps in use, 49 of them being of the power just named.

In his general remarks, Mr. Whatmough expresses regret at the decreased profit, as, he says, there was every indication before the war that the year would be a favourable one. But short time in the cotton trade, and the lighting restrictions under the Defence of the Realm Act caused a large decrease in revenue; the total for ordinary sales and public lighting amounting to £903. Residuals, especially tar, were also a cause of anxiety to the Gas Committee, as very little pitch was shipped, and special arrangements had to be made with the contractor for storage. The market for sulphate of ammonia was also unfavourable; and on these two products alone there was a deficit of £514. The Committee generously offered to supply gas free of charge to the Belgian refugees and the Athletes' Volunteer Force.

Mr. Whatmough says the prospect for the current financial year is not encouraging, as coal prices are abnormally high, and there is no indication of a reduction in the future. In 1914 coal was 14s. 3d. per ton; whereas for the current year it is 19s. 3d. The increased cost of 5s. per ton represents 6d. per 1000 cubic feet for a twelve months' supply; but as the present contracts do not expire until August next, the Committee are in a position, with a contribution from the reserve fund, to meet the obligations of the department by advancing the price of gas 2d. per 1000 cubic feet to prepayment consumers, and 3d. to all others. In addition to the increased cost of coal, there will be extra charges for rates and taxes, contributions to workmen serving with His Majesty's Forces, and increase of wages and materials; so it is thought that the small advance in the price of gas will be favourably received by the consumers.

The report came before the Town Council at their last meeting, and was approved.

MARYPORT GAS UNDERTAKING.

Annual Report of the Engineer and Manager.

The report of the Gas Engineer and Manager of the Maryport Urban District Council (Mr. C. Harris) for the past financial year came before the Council at their last monthly meeting, and was characterized as satisfactory by the Chairman of the Gas Committee (Mr. Hardy). A debit balance of £37 on the previous year has been changed to a credit balance of £47, though £905 has been paid out of revenue for the new regenerator retort plant, and £86 spent on repairs and renewals; while the reduction which the Council made some time ago, of 4d. per 1000 cubic feet in the price of gas, has, as Mr. Hardy pointed out, left £707 in the pockets of the consumers. A further reduction would have been considered but for the rise in, and uncertainty as to, the price of coal. During the year the supply of the village of Flimby has been completed; 3½ miles of mains being laid, 50 public lamps erected, and 419 consumers connected. Nearly every house on the line of supply has been fitted up. The erection of the new retort-bench has resulted in less coal being used and more gas made. There were 4225 tons of coal carbonized a—reduction of 396 tons; and the make was 47,906,000 cubic feet, which was an increase of 2,828,000 cubic feet, or 5·9 per cent., on the previous year. Each ton of coal produced 11,341 cubic feet, being 1694 cubic feet more than before; while 1369 tons of coke were sold—equal to 6·48 cwt. per ton of coal, against 5·2 cwt. last year. Of tar, 49,034 gallons were sold—an increase of 4567 gallons, or 11·6 gallons per ton of coal, against 9·8 gallons before. There was a total make of 28 tons 10 cwt. of sulphate of ammonia, or 15·1 lbs. per ton of coal, compared with 10·3 lbs. in 1913-14.

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Braddock's New Patent Enclosed Retort-House Governor, Latest Type.

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Telegrams: "METRIQUE, LAMB LONDON." Telephone No. 2412 HOP.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *May* 21.

There is no alteration to record in the market for tar products, and values generally remain about the same as last reported.

In sulphate of ammonia, the position continues firm both for prompt and forward delivery; makers' prices remaining respectively £13 7s. 6d and £13 5s. per ton net, at makers' works, for 25 per cent. quality.

Tar Products in the Provinces.

May 21.

Markets for tar products still remain fairly steady. Naturally the demand for pitch for near delivery has slackened owing to the approaching warm weather, and steamers are not very willing to carry for export. However, the price remains steady, and makers are asking a somewhat advanced price for forward delivery. Creosote is quiet, and there is still a fair amount offering for delivery right up to the end of this year. Solvent and heavy naphthas are in very good demand. Crude carbolic makers are asking a high price for this article, but not many transactions are heard of.

The average values of gas-works products during the past week were: Gas-works coal tar, 22s. 3d. to 26s. 3d. Pitch, East Coast, 21s. to 22s.; Norfolk, Suffolk, and Humber ports, 18s. to 19s. per ton; West Coast, 19s. to 20s. Manchester; 20s. to 20s. 6d. Liverpool; 23s. to 24s. Clyde. Benzol, 90 per cent., naked, North, 10½d. to 11d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. to 2s. 4d. Crude naphtha, in bulk, North, 5⅞d. to 6¼d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, naked, North, 1s. to 1s. 1d. Creosote, in bulk, North, 3d. to 3⅛d. Heavy oils, in bulk, 3¼d. to 4d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 3s. 4d. to 3s. 5d. Naphthalene, £8 to £16; salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *May* 21.

During the past week the tone of the market has continued strong in all positions, and values have again increased to some extent. A large inquiry has been experienced for export, mainly for shipment to British possessions and to the Far East, and a considerable volume of actual business has resulted. The closing quotations are £13 16s. 3d. per ton f.o.b. Hull, £13 17s. 6d. per ton f.o.b. Liverpool, and £14 per ton f.o.b. Leith. For future delivery, £14 per ton for July-December in equal monthly quantities has been paid to producers for both Leith and Liverpool shipment, and some makers have now raised their limit over this period.

Nitrate of Soda.

There is no new feature in the market for this article, and values are maintained at 12s. 10½d. per cwt. for ordinary, and 13s. 1½d. for refined quality, on spot.

Sulphate of Ammonia.

From another source it is stated that this market still remains steady, and in some quarters there are reports that better prices have been paid. Outside London, makes are quoted at £12 17s. 6d.; Hull, £13 10s. to £13 12s. 6d.; Liverpool, £13 12s. 6d.; Leith, £13 15s.; Middlesbrough, £13 10s. to £13 12s. 6d.

Salford Lighting Charges Increased.—A special meeting of the Salford Town Council was held last Wednesday for the purpose of fixing the rates, which were increased 6d. in the pound, to 7s. 5d. During the proceedings it was stated that the Lighting and Cleansing Committee's estimate showed an increase of £6113, of which £4179 was under the heading of wages, and included allowances to men on active service and war bonus; while £1050 was on account of the increased cost of gas for the street lamps.

A Good Year at Middleton.—At the last meeting of the Middleton (Lancs.) Town Council, it was announced that the profit on the gas-works for the past year amounted to £895. Mr. Hilton, in moving the adoption of the minutes of the Gas Committee, said he thought the figures were "extraordinarily good" when they considered the adverse circumstances through the war, the prices obtainable, and the less amount received for residuals. The sale of gas last year amounted to £123 less than before; while the receipts for residuals were £428 less. They had broken one or two records during the year. One was in respect of leakage, which had been a serious item in the past and which this year amounted to 5·82 per cent., while the amount of gas carbonized per ton of coal was also a record—12,341 cubic feet.

South African Lighting Association, Limited.—In the report which the Directors of the Association will present at the general meeting to-morrow, they state that the business has been prejudicially affected by the war, more particularly at Port Elizabeth, where trade has been seriously interfered with; and in consequence the sales of gas at this station show a marked decrease. At Grahamstown, however, the output last year was practically the same as in 1913. The increased price of materials has also adversely affected the working. In view of these circumstances, the Directors decided, though with reluctance, to increase the price of gas at Port Elizabeth as from the 1st of April last. They recommend the payment of a dividend at the rate of 8 per cent. for the year, less income-tax. Of this, 3½ per cent. was paid as an interim dividend in October last; and the final dividend of 4½ per cent. will come to £4050, leaving a sum of £2403 to be carried forward—approximately the same amount as was brought into the accounts from 1913.

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Patents 15455/09, 8521/10, 12346/12, 14717/12, 21112/12, 15758/13, 2839/12, 25478/13, 26259/13, 23350/13, 15778/14, 5984/15.

COMPRISE THE APPLICATION OF TWO MAIN PRINCIPLES.

(I) Downward displacement of flues.
(II) A constant ratio between the pressures of two (or more) elastic fluids when brought together for the purpose of combustion.

WHEN APPLIED TO CRUCIBLE FURNACES.

The economy of gas has been demonstrated to be 50 per cent., and more, over those in general use. In the case of 70/30 brass, the consumption is 2 c' per lb.

WHEN PRINCIPLE II IS APPLIED TO LIGHTING

50-candle power and more is obtainable at low pressure per cubic foot.*

WHEN BOTH PRINCIPLES ARE APPLIED TO WATER HEATING

A 97½ per cent. efficiency has been obtained.

PRICE LIST.

Pressure balance for ¾-inch gas-main . £10 or quarterly rent of . 10s.
" 1½ " " . £20 " " . 20s.
" 3 " " . £40 " " . 40s.
For sizes above, by arrangement, either on a basis of half economy or by a predetermined arrangement on the basis of the amount of gas consumed in three preceding years.

PRICE OF BRASS MELTING FURNACES.
4s. to 7s. per lb., capacity according to the quality of fire-clay used.

PRICE FOR STREET LIGHTING.
By arrangement on a basis of the amount economized.

For further particulars apply to—

A. C. IONIDES, 34, Porchester Terrace, W.

INSTITUTION OF GAS ENGINEERS.—Mr. Ionides will be pleased to welcome at his laboratory gentlemen who are in town for the meeting of the Institution.

Smoke Abatement Work in Manchester.

The first annual report of the Air Pollution Advisory Board—one of the Manchester City Council's new Committees—on the atmospheric pollution of Manchester has been published. Mr. E. D. Simon, the Chairman of the new Board, points out in the report that the work of the Board represents an attempt on the part of the City Council to tackle the problem of smoke abatement on new lines. Sectional committees dealing with the chemical problem, collection of statistics, &c., have been formed, and the research work should be specially valuable. On summarizing the results so far secured, the Committee point out that the air of Manchester is so filled with dust and smoke that on a sunny day no less than 10 per cent. of the sunlight is cut off in passing through the last 100 feet of the atmosphere. The Board are convinced that the public do not yet realize either the economic cost of the smoke evil, nor —what is more important—the effect it has on health and happiness through the mental depression which results from living in an atmosphere of gloom. Methods are already known which, if more widely adopted, would greatly improve the state of the atmosphere without inflicting hardships on manufacturers or others. The present intention of the Board is accordingly to continue to work along the following main lines: (1) To endeavour to bring home to the public the seriousness of the damage done by smoke; (2) to spread reliable information as to the best methods of smoke abatement; (3) to discover, if possible, by research, new and improved methods of smoke prevention.

Skelmersdale Gas-Works Extensions.—The Skelmersdale Urban District Council have resolved to make application to the Local Government Board for sanction to borrow £2000 for extensions and improvements to the gas-works. The gasholder was erected in 1877, and is now in a very bad condition; while the condensers and other plant cannot be considered safe.

Rochdale Gas Prices to be Increased.—At the last meeting of the Rochdale Town Council, Alderman Heap asked whether the Gas Committee had considered the advisability of increasing the price of gas. In reply, Mr. Walker, the Chairman of the Gas Committee, said the question had already been discussed in Committee, and he expected at the next Council meeting to table a resolution dealing with the question. During the last thirty years the general course of gas prices in Rochdale had been, with slight contrary fluctuations, downwards. In the early 'eighties the price was 3s. 6d. per 1000 cubic feet; in the middle of that decade it was reduced to 3s. 3d.; then to 2s. 9d. for a long period of years. About 1900 the price charged was 3s.; from 1903 onward it had been successively lowered to 2s. 10d., 2s. 8d., and 2s. 6d., at which figure it now stands. The last change, a reduction from 2s. 8d. to 2s. 6d., took place in 1911. Writing later, our correspondent learns that at a meeting of the Rochdale Gas Committee on Friday, it was decided to recommend to the Council that the price of gas should be increased 6d. per 1000 cubic feet.

Bollington Gas Price Increased.—The Bollington Gas Committee have decided to increase the price of gas by 8d. per 1000 cubic feet.

Bury Gas Prices Increased.—The Gas Committee of the Bury Corporation have decided to increase the price of gas 3d. per 1000 cubic feet from 2s. 3d. to 2s. 6d.

Heywood and Middleton Water Board.—At a meeting of the Board last Thursday, it was reported that the loss on the undertaking for the past year was £11,509. This will fall on the ratepayers of the two towns. Those of Heywood will have to find £5826, and those of Middleton £5683. The loss is the largest in the history of the Board; and the war is put down as one of the contributing causes.

Breaches of Lighting Regulations at Nottingham.—Heavy fines were last week inflicted by the Nottingham Magistrates for breaches of the military lighting regulations. One defendant was the Manager of the "Talbot;" and the police evidence was that there was an excessive glare from a second storey window of the building. Defendant denied that the lighting was excessive, and asserted that there was only one pair of 24-candle power lamps burning, and that these were 18 feet from the window. The Magistrates, however, imposed a fine of £5. They ordered another tradesman to pay £2 for neglecting to reduce the inside lighting of his shop.

A "Dishonest Defence."—Judge Graham, K.C., at the Bradford County Court, last week, heard an action in which a workman named Metcalfe claimed from the National Union of Gas Workers and General Labourers disablement benefit, amounting to £15, after an accident by which he lost the sight of an eye. Among the points for the defence were that, by the rules of the Society, the Executive had absolute discretionary power as to all claims, without appeal to any Court of Law, and also that, as it was an illegal Society, it could not be sued. The Judge decided in favour of the plaintiff, and declined to give leave to appeal on the question of jurisdiction, saying that, after taking a man's money as a member, to turn round and say they would not pay his disablement benefit was, in his view, a dishonest defence.

Gas Prices Increased at Oldham.—At a meeting of the Oldham Gas Committee last Wednesday it was decided to increase the price of gas by 6d. per 1000 cubic feet, the change to become operative at June quarter-day. At present the price to householders is 2s. 5d. per 1000 cubic feet, with 6d. discount if paid within the month. The advance is attributed to the increased cost of production. Mr. A. Andrew, the General Manager, reported that the loss on the undertaking last year amounted to £18,205, including the statutory charge of £7500 paid to the borough fund. Additional expenditure that would probably be incurred during the current year on coal, &c., would result in a further estimated loss of £36,687. An increase of 6d. per 1000 cubic feet in the price of gas would produce about £37,000. He estimated for an increase of 3s. per ton in the price of coal. The Chairman of the Gas Committee (Alderman H. Wilde) considered the price of gas should have been increased earlier.

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Evesham Gas Undertaking.

In moving the adoption of the minutes of the Gas Committee at the meeting of the Evesham Town Council last Wednesday, Alderman Fisher said the balance-sheet for the year ended March 31 last had been certified by the Auditors (Messrs. H. Leicester and Co.), and he would give the Council a few particulars. The total expenditure had amounted to £10,051, while the receipts were £11,556, which left a balance (gross profit) of £1504, against £2280 for the previous year. The cost of all materials, as the Council were doubtless aware, had gone up considerably. Fortunately the quantity of gas sold had increased from 52,624,000 to 54,502,000 cubic feet, notwithstanding the discontinuance of the greater part of the public lighting. The receipts from the sale of gas amounted to £7935, against £7645. The residuals market had not been so good. The receipts from this source amounted to £2832, against £3022. The balance of the revenue account had been disposed of as follows: £638 had been written-off the capital account for depreciation. Interest and instalment of loan had absorbed £69, and contributions to rates £600, which left a balance of £196. The balance-sheet showed that they had expended £1130 upon new plant and extensions, also £148 upon new meters. On March 31 they had stock of coal and other materials to the value of £560; amounts due for gas, residuals, fittings, &c., £1871; cash due from the bank, £1384. On the other side of the balance-sheet, the whole of their outstanding liabilities were represented by two amounts—£620 for loan account and £853 due to sundry creditors. The undertaking, therefore, was in a very sound position financially, which should help them to overcome the difficulties of the present times.

Carlow Gas Company.—At the annual meeting of the Company, the report, which was passed, stated that the capital was £5210; the investments representing, at present market value, £5417. The net profits were 13¼ per cent.; and a dividend of 8 per cent., the same as last year, was declared.

Donington (Lincolnshire) Gas Company.—It was reported at the annual meeting of the Company (over which Mr. J. B. Dods presided) that, owing to increased cost of coal and the expense involved in unanticipated repairs at the gas-works, no dividend would be available for shareholders this year.

Water and Borough Engineership at Blackburn.—At a meeting of the Sub-Committee of the General Purposes Committee of the Blackburn Corporation last Wednesday, it was decided to recommend that the position of Borough and Water Engineer be advertised at a commencing salary of £700 a year.

Portsmouth Water Company.—The report for the half year ended March 31, to be submitted at the forthcoming meeting of the Borough of Portsmouth Water-Works Company, states that the available balance on the profit and loss account is £29,554, out of which the Directors recommend the payment of the full statutory dividends. This, after providing for void houses, will leave a balance of £9676 to be carried forward. During the half year, 144 yards of additional street service-mains have been laid; the total length of these being now just under 175 miles. No trunk mains have been laid during the six months; the length of these remaining at 67¾ miles. The net increase in the number of supplies has been 191; the total number of premises under constant supply throughout the whole of the Company's district being at the end of March 53,938, and the number of consumers approximately 265,000. The quantity of water supplied for all purposes during the half year was 1,573,097,190 gallons, equal to an average supply of 8,643,391 gallons per 24 hours. The Directors regret to record the death of their late colleague Colonel C. Lanyon Owen, who was appointed a member of the Board in 1880, and acted as Chairman from the early part of 1912. Mr. William Gillman has been elected Chairman, and Sir Scott Foster Deputy-Chairman.

The Port Talbot District Council have decided to borrow £5000 for the purpose of providing and fixing complete slot installations, and to meet contingencies in connection with their new works. It was also agreed that slot-meter installations be provided in houses assessed up to a rateable value of £12.

The Davis Gas-Stove Company, Limited, have issued a new geyser booklet, in which the domestic convenience of having a supply of hot water furnished instantaneously and continuously is again emphasized. The special features of the Davis geysers are pointed out, and illustrated particulars and prices of the various types, with hints to buyers, are given.

The new Regent Palace Hotel, which occupies a site a few yards from Regent Street, and will be open to the public to-morrow, is the largest of its kind in Europe. It contains upwards of 1000 bedrooms, each being supplied with hot and cold water; and guests are offered the luxury of a soft water supply—the softening installation having been carried out by Messrs. Lassen and Hjort, who have made water purification their speciality. The kitchens, boiler-house, and heating system are also supplied exclusively with soft water from a separate Lassen-Hjort installation placed in the basement. The Lassen-Hjort and Permutit patents are worked by United Water Softeners, Limited, of Imperial House, Kingsway, W.C.

The Westminster City Council decided to place an illuminated sign over a convenience in York Place, Adelphi; and the City Engineer was instructed to get quotations for signs lighted by gas or electricity. The prices were: Gas—For supplying and fixing sign complete with two 80-candle power incandescent gas-burners, £5. Annual cost of gas, lighting, extinguishing, and cleaning and maintaining the burners and the sign, £5 8s. 8d. Electricity—For sign complete with two 30-candle power lamps, £6 10s. Annual cost of current, cleaning, and maintaining, £5 10s. The City Council have decided in favour of a gas-sign, which will be provided by the Gas Light and Coke Company.

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of advantage from the many found in our Slot Meters are:

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2nd.—The Slot is closed when the maximum number of Coins have been inserted.

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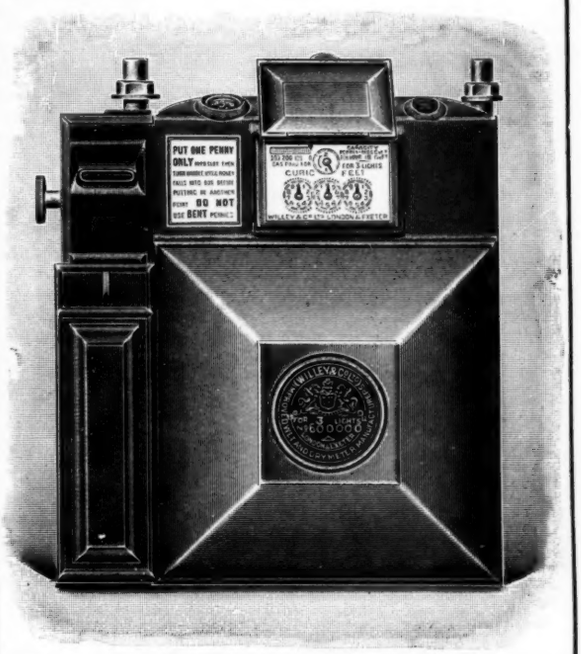

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The Sevenoaks Gas Company have placed an order with Messrs. Gibbons Bros., Limited, for a "Guest-Gibbons" stoking machine, with coal elevator, hoppers, generating plant, and electric crane; also an order with the Chemical Engineering Company, Limited, for a tar dehydrating plant.

An application was made last Thursday to Mr. Justice Astbury, in the Chancery Division of the High Court of Justice, in connection with a petition of the Newhaven Gas Company for authority to substitute Memoranda and Articles of Association for a Deed of Settlement, the object being to extend the Company's borrowing powers and develop the business. The petition had been before his Lordship on a previous occasion, when he gave his assent, subject to the consent of all the shareholders being obtained. Counsel said they had all done so with one exception, a lady holding 65 shares, who objected to one clause being altered. He now applied for the order to go on in spite of the lady's objection. His Lordship granted the application on the Company filing an affidavit exhibiting the letters from the lady, and proving the consents of the other shareholders.

GAS COMPANIES IN THE STOCK EXCHANGE.

The Stock Exchange had rather a quiet time last week, owing in some measure perhaps to the advent of Whitsuntide; and it was quite devoid of any striking or strongly marked feature. The general tone was pleasantly cheerful; being imparted by the intelligence which arrived early in the week of a substantial advance effected on the Ypres front by the British. Several markets gained more or less in strength. Home rails and American were among the number. But the most conspicuous improvements were in the recent issues of short-dated Colonial Loans, which rose steadily day by day. The ranks of the short-dated issues are about to receive an important recruit in the shape of £1,000,000 North Eastern Railway 4½ per cent. preference stock redeemable in ten years. A feature of the week was the large demand for Treasury Bills; and a new departure of fair promise was the opening by Lloyds Bank of its books to "Savings' Accounts." Business in the Gas Market continued very quiet; and the firmness which has characterized the last few weeks remained unimpaired. The Money Market still showed marked ease.

Bargains done for cash during the week were as follows: On Monday Cape Town 1⅛, European 14, Gas Light Ordinary 89½, ditto preference 87, 87½, Imperial Continental 80, 80⅛, 81⅜, South Metropolitan 94¼, 94⅜, 95, 95¼, 95½, ditto debenture 67¼. On Tuesday, Brentford new 93, 93½, European 14½, Gas Light ordinary 89¼, 89½, 89⅜, ditto preference 87½, 88, Primitiva 3½, River Plate 78. On Wednesday, Brentford new 92, Gas Light ordinary 89¼, 89½, 89¾, 90, ditto maximum 69¼, 69⅜, ditto preference 87¼, 87⅜, Imperial Continental 80, Primitiva preference 4½, 4 11/16, South Metropolitan 94¼, South Suburban debenture 109½, 110. On Thursday, Bournemouth debenture 89⅜, 90¼, British 37¼, Gas Light ordinary 89, 89⅛, 89¾, 90, Melbourne 96⅜, 97⅜, Primitiva 3 11/16, South Metropolitan 94½. On Friday, Brentford old 99½, 100, ditto new 92, 93, Brighton and Hove debenture 84, 84½, Gas Light ordinary 88⅛, 88⅜, 89, 89½, 90, Imperial Continental 80, 80⅛, 81⅛, 81½, Melbourne 97⅜, South Metropolitan 95½. On Saturday, the Exchange was closed.

Bank rate (fixed Aug. 8), 5 per cent.; last year, 3 per cent.

LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING MAY 22.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59—64	3 18 2	..
374,000	,,	July 10	4	Do. 4 p.c. Deb.	76—79	5 1 3	..
280,000	5	April 29	7½	Bombay, Ltd.	5¼—6⅜	5 17 8	..
50,000	10	Feb. 26	16	Bournemouth Gas and Water { 10 p.c.	29—30	5 6 8	..
873,480	10	,,	7	B 7 p.c.	15—15⅜	4 10 4	..
95,000	10	,,	6	Pref. 6 p.c.	13¾—14	4 5 9	..
—	—	—	—	Deb.	.. —	83⅜—90½	..
330,000	Stk.	Feb. 26	14	Brentford Consolidated	261—266	5 5 3	99¼—100
330,000	,,	,,	11	Do. New	204—209	5 5 3	92—93½
50,000	,,	,,	5	Do. 5 p.c. Pref.	109—111	4 10 1	..
206,250	,,	June 11	4	Do. 4 p.c. Deb.	91—93	4 6 0	..
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208—213	5 3 4	..
244,200	,,	,,	8	Do. A Ord. Stk.	154—159	5 0 8	..
530,000	20	Mar. 26	12½	British	44—45	5 11 1	37¼
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	Cape Town & Dis., Ltd.	1⅛—2⅛	—	1⅛
100,000	10	—	—	Do. 4½ p.c. Pref.	4—6	—	..
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord.	108—110	4 10 11	..
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106—108	5 1 3	..
560,000	,,	,,	5¼	Do. 3½ p.c. Deb.	103—105	5 1 6	..
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	69¼—71⅛	4 3 11	..
800 000	Stk.	,,	4	Continental Union, Ltd.	76—79	5 1 3	..
200 000	,,	,,	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
—	—	—	—	Croydon B and C 7 p.c.	.. —	—	..
492,270	Stk.	—	6	Derby Con. Stk.	123—125	4 16 0	..
55,000	,,	—	4	Do. Deb. Stk.	102—104	3 16 11	..
1,002,180	10	July 29	10	European, Ltd.	17⅛—18	5 11 1	14—14½
16,384,910	Stk.	Feb. 12	4/17/4	Gas Light and Coke { 4 p.c. Ord.	98—102	4 15 6	88½—90
2,600,000	,,	,,	8½	3½ p.c. max.	76—79	4 8 7	69½—69⅝
4,062,235	,,	,,	4	4 p.c. Con. Pref.	96—99	4 0 10	87—88
4,674,850	,,	June 11	3	3 p.c. Con. Deb.	72⅛—74½	4 0 6	..
130,000	,,	,,	10	10 p.c. Bonds	.. —	—	..
258,740	Stk.	Mar. 12	5	Hastings & St. L. 5½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	Hongkong & China, Ltd.	16⅛—16⅜	6 11 4	..
—	—	—	—	Hornsey 7 p.c.	.. —	—	..
131,000	Stk.	Mar. 12	7⅛†	Ilford A and C	151—154	5 2 4	..
65,780	,,	,,	6⅛†	Do. B	115—118	5 8 0	..
65,500	,,	June 26	4	Do. 4 p.c. Deb.	92—94	4 5 1	..
4,940,000	Stk.	May 14	9	Imperial Continental	150—160	5 12 6	80—81¾
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	..
200,342	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c.	119—121	5 7 6	..
561,000	Stk.	Feb. 26	10	Liverpool 5 p.c. Ord. { A	211—213	4 13 11	..
718,100	,,	,,	7	{ B	146—148	4 14 7	..
306,083	,,	June 26	4	Do. 4 p.c. Pr. Deb. Stk.	.. —	—	..

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
75,000	5	June 11	6	Malta & Mediterranean	4⅛—4⅜	6 9 9	..
250,000	100	April 1	4½	Met. of Melbourne { 4½ p.c. Deb.	99—101	4 9 1	96¾—97½
541,920	20	May 28	4	Monte Video, Ltd.	11½—12	6 13 4	..
1,775,892	Stk.	July 29	4½	Newc'tle&G'tesh'd Con.	98⅝—99⅛	4 10 6	..
529,705	Stk.	June 26	3½	Do. 3½ p.c. Deb.	82—83	4 4 10	..
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14—15	5 2 8	..
800,000	Stk.	May 14	8	Oriental, Ltd.	117—122	6 11 2	..
60,000	5	Mar. 26	10	Ottoman, Ltd.	7⅛—7⅜	6 9 0	..
60,000	50	Feb. 26	18	Portsea, Island B	128—131	4 19 3	..
100,000	50	,,	12	Do. C	118—121	4 19 2	..
52,000	50	,,	10	Do. D	.. —	—	..
249,980	5	April 29	6	Primitiva Ord.	5½—6	6 18 4	2 1/16—3 1/16
499,960	5	June 26	5	,, 5 p.c. Pref.	4⅝—5	5 0 0	4 1/16—4 3/16
521,600	100	June 2	4	,, 4 p.c. Deb.	91—93	4 6 0	..
—	—	—	—	,, ,, ,, 1911	.. —	—	..
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85—87	4 12 0	78
150,000	10	May 14	6	San Paulo { 6 p.c. Pref.	10¼—11	5 9 1	..
125,000	50	July 1	5	{ 5 p.c. Deb.	47—49	5 2 0	..
135,000	Stk.	Mar. 12	10	Sheffield A	223—224	4 9 8	..
209,984	,,	,,	10	Do. B	222—224	4 9 8	..
523,500	,,	,,	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	South African	10¾—11⅛	7 16 6	..
6,429,895	Stk.	Feb. 12	5/9/4	South Met., 4 p.c. Ord.	111—113	4 16 8	94⅛—95⅛
1,895,445	,,	July 10	3	Do. 3 p.c. Deb.	72⅜—74⅛	4 0 6	67⅛
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	167—169	5 6 11	..
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114—116	5 3 6	..
60,000	,,	,,	5	Do. 5 p.c. Pref.	110—112	4 9 3	..
—	—	—	—	Do. West Kent.	.. —	—	..
137,058	,,	June 26	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	103½—110
629,740	Stk.	May 14	5	Southampton Ord.	99—102	4 18 0	..
120,000	Stk.	Feb. 12	7½†	Tottenham { A 5 p.c.	135—138	5 8 8	..
742,275	,,	,,	6†	District { B 3½ p.c.	115—117	5 2 7	..
181,255	,,	June 26	4	4 p.c. Deb.	87—89	4 9 11	..
182,380	10	Dec. 30	5	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93—95	5 5 3	..
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	103½—109½	4 11 4	..
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	,,	,,	6⅜	,, B 3½ p.c.	129—134	5 2 7	..
108,075	,,	,,	5/17/8	,, C 3½ p.c.	110—115	5 2 0	..
352,000	,,	,,	6⅜	Wimbledon 5 p.c.	117—122	5 0 5	..
98,000	,,	,,	6⅜	Epsom 5 p.c.	121—126	5 5 2	..
88,416	,,	June 26	3	3 p.c. Deb. Stk.	66—69	4 6 11	..

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